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the Institutes

of Medicine

by

William Cullen

Vol. 2

Glasgow 1788

Lectures
upon
the Institutions
of Medicine
by
William Cullen M.D.

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Methodus Medendi.

This I shall endeavour to give complete. To know its proper extent and objects recollect our Division of Institutes, into,

1. The doctrine of health or the explanation of functions as exercised in health; this is *Physiologia*.
 2. The doctrine of disease or *Pathologia*.
 3. The doctrine of means, which extends to the preservation of health as well as to the cure of diseases — Accordingly two views have been taken of this, that of preserving health called *Hygeina*, but we neglect this division as it consists rather in avoiding the causes of disease than prescribing direct means to preserve Health. The other part gives us the *Therapeutic* commonly called too the *Methodus Medendi*; this consists of the general principles of the operation of remedies, and as it has been generally treated contains an account of particular remedies; this however is not my province but belongs to the *Materia Medica*. —
- Our *Methodus Medendi* then includes the general principles

principles of the Operation of Medicines. It is either
 Empiric or Dogmatic. On the Empiric plan we
 speak of a remedy to be exhibited in a certain
 disorder, & in certain circumstances without con-
 sidering it's mode of operation on the body, but
 merely, as it is found useful by casual experience.
 In the Dogmatic we consider remedies as possessed
 of certain qualities, & as they are fitted to change
 Solids, fluids, or motions, and as this change is
 applied to the body to remove disease. — (Here we
 are supposed to know the exact state of the body,
 to exhibit proper remedies, of which we must
 know why & how they operate) — This last only is
 a part of our plan of the Institutions of Medicine.
 We shall often add too the affairs of Experience,
 when they occur, in our Methodus Medendi — from a
 comparison of Physiology & Pathology we consider
 the state of the functions in any deviation from
 health, and hence deduce the means of removing
 the changes; this deduction has been called an
 Indication. In general the *Quid agendum* may
 be said to be an Indication or Intention of the
 Physician, but often this intention may be in com-
 mon both with Empiricism and Dogmatism. But
 strictly

strictly by Indication we mean not only the *Quid*
Agendum, but the *Quomodo Agendum*; thus if I say
 The intention is to cure Pleurisy by V.S. it is Empi-
 rical, but if I say that V.S. effects a cure by *dimin-*
ishing the increased Impetus in which Inflammation
 consists it is Dogmatical. Strictly then diminishing
 the Impetus is the Induction, that is to say the
 Perception in the Mind of the Physician of the change
 to be induced. But authors have used the term
 vaguely, thus Dr Boerhaave & others before him
 say *Invantia & ledentia indicant*, but this is
 Empirical & not connected with a Dogmatic plan,
 the *Invantia & ledentia* implying either an Em-
 piric practice or the recurring to this when we
 cannot form Indications, and therefore the forming
 Indications according to this sense of the word
 distinguishes a Dogmatic plan. The several signs
 indicating the Proximate Cause are properly cal-
 led *Indicantia*; the same variety of use was in-
 -curried in this term, every thing from reason or
 experience that directs our cure may be called
 Indication, but this is a very vague use of the
 term. The several means for producing the changes
 indicated

indicated are called *Indicata*, properly confined to our consideration of the remedies as suited in their operation to remove disorder. We are to reduce the several remedies to general heads of Indication, when we shall mark out the general *Indicantia*, and lastly a general account of the *Indicata*, not a general view of the *Materia Medica*, but general rules for their Administration to some particulars.

The term Indication taken in it's usual lax sense has been divided into four heads

- I. *Indicatio Conservatoria.*
- II. *Preservatoria.*
- III. *Curatoria.*
- IV. *Mitigatoria.*

1. The *Indicatio Conservatoria* is called likewise *Indicatio Vitalis*. It is the means of supporting the Economy so as to preserve life & support it's powers. — 2. *Indicatio Preservatoria* is the defending the body against the *potentia nocentes*, avoiding the action of external bodies & regulating the actions of our own body; As these may aggravate or prove remote causes of diseases, this is otherwise

wise called *Indicatio Prophylactica*. 3. The *Indicatio Curatoria* is the proper Dogmatic Indication, it is the change of the Proximate Cause of disease into health. 4. The *Indicatio Mitigatoria* is called *Palliativa* that is when we either do not know the *Causa proxima* or cannot overcome it we obviate as well as possible the tendency of particular Symptoms. These do not require a separate consideration, and the consideration of the *Indicatio curatoria* will in a great measure support the rest—thus as to the first it is not only a question whether it is not always connected with the *Indicatio curatoria*, but if upon any occasion it deserves a separate treatment it will come under our division of *Curatoria*. Boerhaave in his *Cardiaca & Dieta Agri* particularly in 1095 & 1096 &c gives place to this; and by consulting the intentions thereby mentioned, you will find they are answered by *Nutrientia*, *Astringentia*, *Stimulantia*, &c. As to the *Mitigatoria* if it is Dogmatic it is by considering the *Causa proxima* of the Symptoms to be palliated, and therefore we

we shall comprehend in the *Indicatio Curatoria* every case applicable to particular symptoms an *Indicatio Mitigatoria* — As to the 2^d as it is avoiding Remote Causes & removing them, it is *Empiric*. If *Dogmatism* is in any case to be considered it comes exactly under the *Indicatio Curatoria*, and it will turn upon a knowledge of the proximate Cause. It has been customary with Systematics to propose general rules previous to the particular treatment — I shall not do this. I have often said nothing is of more use in Science than the generalization of facts; the same likewise with rules — a single *Empirical* rule may in a particular case be useful, but we shall never make them clear and extensive without generalizing. But as the best things may be abused, so general rules carried too far lose sight of all application.

The general rules laid down by Systematics I used formerly to give an account of, but I now find this to be unnecessary as they are most of them the simple suggestions of common sense, being identicall propositions implied in the meaning

meaning of the terms we have mentioned; neither are many of them to be admitted as general, for when we enter into a consideration of them we discover exceptions sufficiently numerous to divest them of that denomination. I shall therefore omit those which are given us by Boerhaave & consider some of Hoffmann's which contain principles that require some discussion.

1.^o *Omni bus in Morbis &c.*

Nothing from the time of Hippocrates down to Sydenham employed the attention of Men more than the *Vis Naturæ Medicatrix*. The Animal Economy easily restores small deviations of its balance which is much prized, & tho' temporary variations happen, yet from the nature of its fabric it soon restores itself. You must have observed the Illustration of this in Physiology & Pathology—thus of heat & cold a certain Medium is best suited to the Economy, but we are often exposed to such, as without a power of reforming it would soon prove pernicious, when a degree of cold beyond the Medium is applied then the generating power is increased, & vice versa, also in
other

other cases there seems to be a power in our system to redress deviations from health to a considerable latitude. If the vessels are too full the Economy pours out a proper quantity for lessening the plethoric state. When violent diseases are produced we see that it is the consequence of their principia often to excite motions for relieving them from the morbid state. The disorders in which the *vis medicatrix* is conducted & subsists are carefully to be observed; they discover the nature of the Economy & direct the practice of Art. While we grant this we assert the matter has been pushed to excess; thus the Modern Stahlians extend the *Natura Medica* to every disease; they think in disease the Soul perceives the tendency of the causes of diseases, & excites motions necessary for removing diseases. The *Autokratia* they extend to all. This opinion may be easily disproved. Many diseases have none of the salutary effects of Nature, as in Apoplexy, Epilepsy, Paralysis, lues venerea, calculus vesicae, and Cachexy, in these disorders every motion excited so far from having a salutary tendency seems rather

to aggravate the disorder, neither in Schirri has the *Natura Mediatrica* appeared, nor do we perceive what is the tendency of the System. — The ordinary notion of the Action of the *Natura Mediatrica* goes upon the supposition of its conducting the Motions on the most proper & effectual footing; but this is wrong, we often see in fevers where the *Natura Mediatrica* triumphs most, people often die if left to the conduct of Nature. — the soundest Physicians allow that Art ought to regulate Nature's efforts. We should endeavour to guide ourselves thus, that tho' nature is generally to be followed yet she often makes no discernible effort to remove disorder, as instanced above in Epilepsy &c. — here many of the motions seem rather efforts of a *Natura obstructiva*, for often the motions are improper and inadequate, thus she may make a salutary hemorrhagy at the nose, but she may as well do it at the Lungs where it would be pernicious. — Intermittents were said to be efforts of Nature to remove some cause, & that this would be effected by Nature in a few Paroxysms, but since the Quack has been known

known no body has almost waited for nature in the cure. It was not till the times of Chemistry that practitioners ventured to cure diseases without waiting for nature; this period gave rise to specific remedies, these have succeeded without any view to their operation. In Intermittents the Peruvian Bark triumphs over all opposition; the Stahlian indeed do not employ it yet; this circumspection of nature has made Physicians slow & hesitating, thus Boerhaave gives great cautions with regard to the Bark, but in pretty pure Intermittents as soon as the *Apoplexia* comes on we may give the Bark in considerable quantities. Our attention to nature may be in this manner, that as long as we can do no better we must follow nature, but if we can drive off diseases by remedies we should wait little for critical days. I must therefore alledge that the common Language of the *Vis Naturæ Medicatrix* has been extravagant and has contributed to retard considerably the progress of Medicine by our entertaining too great a diffidence in its power. A Dysentery might be supposed a disease to be treated by the *Autoxagaria*,
and

and that the Evacuation carries off the morbid matter; but here no body waits till nature shall correct as well as evacuate. Nature rather by diffusing a ferment increases the disorder. Evacuations are relative to the state of the matter & the passages thro' which they are to pass, thus in the Dropsy a secretion must be increased, the most proper for carrying off the water, the kidneys & intestines are the proper passages for this tho' this is far from an Indication of Nature who commonly retards the secretions in general. Every Treatise of the Methodus Medendi has considered the principal Indications arising from the principal Proximate causes. You will evidently see that the more general and better arranged they are the higher is our Art promoted. This Arrangement has not yet been completed, but to alleviate you from this difficulty I have drawn out a plan in which however I am sensible of many imperfections. Under a Diversity of Theory & System Authors have agreed pretty nearly upon the same heads without so much regard

to

to proximate causes as the operation of medicines. We shall remark this as well as the several alterations in our own plan - You must consider ^{table as a} our Syllabus rather than a pattern. I have, as has of late been done, considered the diseases of fluids and solids. The latter I have divided into the

*Solida Simplicia, &
Solida Viva.*

The first Indication is in Simple Solid (where the matter may be deficient and requires addition. The remedies suited for this stand in the first title of our table and are called

Nutrientia.

This must imply too the supplies in general of the nourishment of our fluids as well as solids. We cannot scientifically say how the matter we employ is applied to either - it is rather from experience than from a knowledge of the manner in which the means operate to the end. We cannot say why the horse who feeds on grass has nearly the same fluids as the carnivorous Lion. I shall

I am persuaded that every softer part of veget. matter contains much alimentary matter, if they are not nutritious it is either from their hard texture or from a deleterious matter contained within them - when the deleterious matter is volatile & is dissipated we often find the remainder very nutritious.

- 1.st gives a general Idea of Nutritious Matter.
- 2.^d consider the causes giving the Indication.
3. the several cases in wch the Indication is opposed.
4. the means by which it is to be executed.
5. the general administration.

These are the several parts tho' the order cannot always be observed - we shall 1st enquire into the nature of the Nutritious matter, of which we make 3 divisions.

1. Vegetable Aliment.
2. Animal.
3. Intermediate.

The vegetable consists of great variety with regard to man & still greater with regard to Animals of the same class, and it would be a question both curious & important to know whether Vegetables have a common nature. I am myself of opinion that they are, and may with propriety be reduced to these 3 heads of

Sugar
Farina

Oil

I gave my reasons before for thinking Sugar Nutritious, and forms the principal part in most
veg

vegetable substances. Vegetables have a common & peculiar matter, most part of this peculiar matter is excluded from our Aliment, the common matter being the nutritious, & this is saccharine, the subject of vinous & Acetous fermentation; the peculiar matters serve rather as remedies than as Nutrient, the other matter is oil. I gave reasons from the Experience of Mankind and from other considerations that Oil is of an Alimentary nature, that it enters into the Composition of the Animal fluids, we see other purposes of Oil in its separate state it is accumulated in Animal bodies in order to give a proper flexibility to all the fibres and to prevent attrition. The oil taken in may be supposed to supply the oil necessary in its proper form in the System — the doubt may remain, but if we consider how many men are nourished well upon oily matter without a larger accumulation of Oil in the System, it will appear to contribute to Nutrition — but Oil does not appear in the blood, & we endeavoured to show it did not appear except evolved by secretion in the Membranes. One principal use of the Oil is that
it

it is reabsorbed, & in case of Emergency can support the Animal for sometime without taking in of Aliment. — When the Oil is reabsorbed from Membranes it does not pass off pure by the Secretories, hence a proof that it is again united and involved in fluids. The quantity that is blended with our Animal fluids gives a strong Confirmation of it's entering into their Original Composition, & is productive of that mildness that we see in most of our fluids. It is not separately united in the circulating mass, but is united by the assimilating powers & enters as a constituent part into the Composition of our fluids. Perhaps and from the above circumstances a presumption may arise that oil enters the Composition of the Coagulable Lymph, & likewise the nutritious matter formed from it.

Perhaps Oil & Sugar separately are not nutritious but require blending together in some manner. I imagine if an Experiment was made with respect to Oil or Sugar separately being the only Alimentary food taken in, they would not either of them be found sufficiently nutritious

nutritious for the purposes of the Economy. They both enter into the Composition of farinæ. Whence Sugar and Oil may be the only alimentary matters - Sugar forms a much more considerable part in vegetables than Oil, Sugar is seldom employed as sole Nutriment, but it is taken in great part. The Slaves in the West Indies grow fatter at the time of getting Sugar from Canes. Many Aliments as the saccharine fruits contain a great deal of Sugar as in grapes. The peasants are observed to fatten during vintage, and when they are dried as figs raisins &c. they are remarkably nutritious, and these constitute the principal diet of many people. The consideration too that it is, contained more or less in all vegetables will lead us farther to think that Sugar is a principal part of the nutritious matter. Farina is found to contain a considerable part of Sugar, and therefore instead of reckoning this the basis of Nutrition I would deduce it's properties of nourishing from it's being a composition of Oil & Sugar.

That

That the farenaceous matter is readily converted into the saccharine the process of mashing sufficiently shews, for in this a sugar is evolved few likewise of the farenacea but we extract oil from in its proper form. I do not think it necessary to push our enquiries any further, or we might consider whether mucilages might not be supposed a 4th head, but as far as our chemistry leads it is formed of sugar & oil. I would further illustrate the subject by going back to the Theory of Chylification, & so far as we establish the nature of Aliment we establish the doctrine of digestion & vice versa, i.e. of vegetables being composed of vegetable acid & oil. All fermentable matter then I would alledge that can unite with oil gives nearly the ~~whole~~ whole of our nutritious matter; this enquiry into the nutritious parts of vegetables applies to particular purposes in distinguishing the nature of several vegetable matters. We have a scale of vegetable matters according to the quantity of Nutrition they contain founded on Experiment.

(see)

We must then consider how much Aliment is found in different matters — perhaps the difference is in the proportion of Oily & fermentable matters, and this as our doctrine of digestion are illustrated by each other. The lowest kind of nutritious matters then are

1. The watery which are most free from any peculiar Juices & from Oily & Saccharine matters, of these are the watery herbs as Greens, Spinage, & leaves of several plants.

2. The succulent roots have the general character of mild & aqueous & consist of the Turneps.

3. Aqueous fruits as cherries containing less sugar & affording less nutriment. — I give you a scale of Nutriment applied pretty far but not with very great accuracy as there are succulent roots that are more nutritious than the aqueous acid fruits, containing a greater quantity of saccharine matter and affording more nutriment. Those fruits whose aqueous parts exhale & we can preserve under the form of dried fruits give us a 4th character in the scale.

4. The

4. The more remarkably saccharine fruits as figs, dates, &c. which may be preserved dry.

5. Those fruits dry as raisins, dates, &c.

6. Farinaceous roots as Potatoes.

7. Farinaceous piths as Sago.

8. Farinaceous seeds, as rice, wheat, &c.

9. Legumina, as Peas.

10. Oily Nuts, as chocolate.

11. Oil itself.

Article 6.th Are those that are naturally aqueous but farinaceous as those found in the roots, stalks, piths, of plants—this likewise comprehends Article 7.th These seeds may be distinguished as more purely saccharine or oily or as the parts are more easily or difficultly extracted, thus Rye & Barley have their saccharine matter more readily evolved than Oats and rice, and these I suppose make a nutriment of a higher degree, between the oily and farinaceous seeds hence the article between these two the legumina; lastly there is the Oil contained in different parts of plants extracted separately.— Some late Experiments of Beccaria and

and Beselmine have given a new view of this subject. The Meat of this may be treated so as to form exhibit two parts of different kinds. 1st the Amilaceous which is readily washed off in water & is liable to a vinous & Acetous fermentation. 2^d a remaining glutinous part not soluble in water & readily runs to putrefaction. In distillation it gives out a Vol. Alk. & seems to resemble Animal Substances in this essentially differing from the Amilaceous part which affords an Acid by the same process. This does not affect our doctrine for in this particular seed the Oil & Sugar seem to be more separate in wheat than in any other Seed. Yet the whole being taken together we find them subject to the same changes with the other farinacea, and is in every respect a Farina like the rest. The Fungi are disputed by Naturalists whether they are a Vegetable or Animal matter. In some respects they seem to have a nearer resemblance to the Animal than the Vegetable nature, and in Chemistry they give Animal results, & late observers have supposed that like Corallines they are formed by Animals. It still remains

mains a doubt whether Corallines are not veg^s & Animals blended. This is a general view of the degree in which Aliment is contained in the several matters. In this Scale we shall find the general proportion of Oil & fermentable matter which are the Basis of Aliment. Having considered the Vegetable we now proceed to the

Intermediate Food.

This is Milk, which is most immediately prepared from Vegetable matters. We conclude it from the consideration of an appearance in this that occurs in no other part of Animals, i.e. the fermentable Acid. Many observations lead to the opinion of this being a production of the new formed Chyle, we shall consider it from it's nature, we find an Acid in it ready to be evolved, & we find an Oil blended with the Acid & easily & almost spontaneously evolved. It contains these two parts of Vegetables, & contains an Animal matter the coagulable Lymph which renders it coagulable. It is from this view that we consider it as an intermediate between the Vegetable & Animal process

A. A Scale of Nourishment in the parts of Milk.

I. Serum of Skimmed Milk.

II. ——— of entire Milk.

III. Butter Milk from entire Milk.

IV. ——— from Cream

V. Cream.

VI. Butter.

VII. Cheesy part or Lymph.

VIII. This with the Butter.

process— On the present plan I shall consider the quantity of Aliment; this gives a scale according to the separation & the proportion of the parts, it is divided into Serum, Oil, & Coagulable Lymph, or into Serum—Butter—Cheese.— If we separate the Cream & the skimmed milk be coagulated the Serum of this will be analogous to that Vegetable matter which is of the lowest degree of Nutriment, A. I. From the Serum's carrying a part of Oil & Lymph, we get more Nutriment from Serum if this be separated from entire milk II. If the Oil is taken away while the Lymph & Serum remain we have better milk III, this furnishes a stronger Nutriment than Serum, & this is different as prepared from Cream or entire milk in proportion as it consists of fewer watery parts. Higher in nutriment than either is the Cream V, & higher still when we take the Butter more purely VI. And as Cheese is chiefly Animal lymph so it is the most nourishing, especially it is so when it retains the oily matter of the Milk VII. VIII. —

Animal

Animal Food.

What particular Animals are properly nutritious, perhaps the whole as we presume they are of a common nature, but many as well as vegetables are rejected as containing Juices of a particular poisonous nature. Except these all Animals seem with more or less propriety to be fitted for nourishing the rest, hence in the world appears a continued succession of destruction & generation. We suppose the human body necessarily requires a vegetable Aliment, and in most instances in a large proportion, & from this we choose the nutritious parts of Animals, those more nearly approaching to the nature of vegetables, hence the Carnivorous birds & quadrupeds are rejected in Aliment, but in some parts of the Earth no regard is paid to this & carnivorous Animals constitute a great part of their food; we however do not observe this with regard to fish, for all fish are Carnivorous and yet all fish are employed in food. We reject only the purely Carnivorous, but we take of the mixed kind, thus the Insectivorous birds which are always likewise

carnivorous

Carniverous. All the Pecora, our common food, are graniverous. We shall here find a considerable difficulty in establishing a scale of Nutriment. I see in general the difference of animal food as containing a larger proportion of nearly evolved saline, & nearly putrescent matter, or as containing a greater quantity of animal fluids less evolved & less perspirable; we chuse food as it is more or less Alcalescent or less perspirable, the saline is more proper than the Alcalescent. In order to fitt matters for perspiration, first evolve them to a saline state; if for some reasons we use so many vegetables & avoid Carniverous Animals it is because they have their Saline matters more readily evolved, as they are more stimulant to the System, are less perspirable, little of them passing off and are more nutritious by their accumulating in the fluids & remaining in the System. Every thing in human affairs is progressive, thus in Aliment, it is only to serve for a short time, then degenerates and is to be supplied by fresh; this progress from the lowest Vegetable to the highest state of Nutriment, thro' these states it

it is more & more degenerated, here then we may say that Animals feeding on vegetables are less degenerated & therefore will subsist longer in our body. The Carniverous Animals as mentioned above are further advanced therefore less fitted to stay in our bodies without degenerating. The different state of Animals may be according to their food even among those that live on vegetables as feeding upon those of more or less nutriment, as the actual saline state remains in quantity & is more readily evolved to an Ammoniacal state. The least Alcalescent Animal food is that from entire Vegetable food - 2. that when food is mixed - 3. such as may change from Animal to vegetable food. Animal food differs in its degenerating or Alcalescent state - those living on vegetables are the least Alcalescent, & those who are graniverous are more alcalescent tend sooner to the putrefactive state than the herbiverous Animals, & therefore tho' for the palate we prefer a stale fed ox yet this renders it more Alcalescent than one that has been fed on grass - as the grain or farina contains a Saccharine matter always blended with Oil & much nearer resembling the nature

nature of the Animal fluids— we have reason to believe that the Assimilating powers in different Animals varies according to the degree of Exercise, thus the domestic Animals have a weaker nourishment than those that range abroad in forests, thus sheep who are commonly confined to a small space have a much less degree of Alcalescency than Deer & tho' their food is the same, but under the same circumstances of food & exercise there are other circumstances of the Economy that give different kinds of nourishment & influence the Alcalescency, thus Goat & Sheep whose diet & exercise is nearly the same are very different in these particulars, so that there must be something in the Economy that makes a further difference, Animal food then differs in Alcalescency or more properly a Saline State. They vary.

1. From their Aliment.
2. From their Exercise,
3. From their particular Economy.

Another circumstance is the readings of Animal matters to pass out of the body— fish, amphibia, most of the worm kind furnish a Saline matter less evolved as we see in subjecting them to putrefaction.

fraction or to Chemical Analysis, they are less perspirable, less Alcalescent, & less Saline than Quadrupeds, those of the bird kind - Young meats are more gelatinous, have their Saline matters less evolved than old ones, are less perspirable & less soluble in the Stomach, hence fish & the flesh of young Animals have been reckoned more nutritious.

We find a considerable difficulty in making a table of the Animal fluids, & are at a loss in applying it to particular species. Animal food may be considered as more or less Saline, & in consequence of this if we can apply it to different species of food we can then discover its effects on the body - The Animal food approaches nearer to the Saline state as birds & quadrupeds compared to the Amphibia fish & vermes - the first have their Saline parts in a more evolved state & are of more easy solution in the Stomach - Old and young meat are likewise distinguished by the same qualities which are perceived in the Stomach, fish and young meat being of much slower solution than old meats, a chicken being longer in the Stomach than a foal & lamb & veal longer than beef or mutton. The reason of this

this is that our Aliment in degenerating goes to a saline state, it is the evolution of Saline matter that prepares matter for excretion; the matter most proper for the saline state is the degenerating, & as the Evolution happens in some degree in the prima via, the young meats & fish are less degenerated, will require a longer time for having it's saline matters evolved. Dr Bryan Robinson of Dublin has a curious fact to this purpose, he had a patient who took a vomit at 6 or 7 at night & dined constantly at 2 oclock, when he eat beef or mutton for his dinner they were undiscernible when thrown up, but when he dined on chicken it was thrown up entire. — there is one circumstance to be added that among the different powers concerned in the Solution of food are the ordinary powers of solution, but besides these are the powers of fermentation, now possibly some food may have relation to the powers of solution, & others to fermentative powers, and this must direct our views upon this subject. Aliment differs as it is more or less stimulant to the System and is more so in proportion to the ready evolution of it's saline parts

parts, but a difficulty of solution may give a stimulus to the stomach, this too is more permanent & therefore Lamb may give more of the debility, fever, & horror, after meals than Mutton which sooner passes off, hence too we explain the greater stimulus of veal than Beef. 3. Animal food differs as more or less perspirable, to be perspired they must be watery or saline, hence the more saline & soluble are the most perspirable, hence Sanctorius found Mutton more perspirable than young meat.

I am now to speak of the use of Aliment to answer our Indication. Its uses are, 1st to fill the vessels, this increases the tension of the system, & on this tension depends the strength & contraction of moving fibres — by giving too much completely a distension of the ventricle of the heart & arterial system, it will prove a more considerable stimulus indirectly they have all their effects as operating upon the stomach. — The tension of this organ influences the whole, but Aliment may too give this a stimulus which will be communicated to the whole system — this operation is difficult to explain — Independent

Independant of direct Stimuli the Action of the Stomach stimulates the System, & gives a degree of fever that more or less accompanies digestion preceded by Hemipulatio & the pulse is very much accelerated. So far then the Stimulus affects the System in two different ways if it is applied to the Stomach & Sanguiferous System. — Whether this depends on the connection of the Stomach with the System or whether from the nature of the Economy the increased influa required for the action of the Stomach is extended to the whole System is a proper object of enquiry, but besides the distension however the Aliment stimulates the Stomach by more or less of Acrimony. Both Animal & Vegetable Aliment have Saline matters which are more or less evolved in the Stomach. The Saline matter is very different according to the different nature of the Aliment. Vegetables give chiefly Acid salts, & therefore the Stimulus is mixed with sedative powers, — whether from this or other causes they do not stimulate so much as Animal food is yet undetermined. The Animal Aliment has an obvious source of Acrimony. I observed that as Aliment has an
obvious

obvious source of Acrimony — I observed that as Aliment went on in the progressive change it evolved more saline matter, and therefore become more stimulant. The fact is certain that Animal matters do excite more of the fever accompanying digestion than any other. Upon this supposition I would observe that the Stimulus of old Animals is greater than young as the former have their Saline matter more evolved. This points out that these Meats ^{are} of different facility of digestion. The Stimulus that is given to the System by the operations of the Stomach is of greater or less duration according to the slow or quick solution of the food; a meal of Mutton will give occasion to a Stimulus arising in the System, but Lamb being of more difficult digestion will remain longer & consequently will be a more permanent Stimulus. — In this way I account for the Stimulant effects that I perceive in eating veal — The stomach feels a greater load with an equal quantity of veal, a greater thirst, & all the symptoms of fever in a degree considerably beyond that perceived by an equal quantity of Beef. We before mentioned the effects

effects of food as more or less perspirable, less perspirable food being more difficult of solution & much longer retained in the System, in consequence of which it will induce a Plethora by retaining a great quantity of nutritious matter, increase the quantity of fluids & bulk of the Solids. Great part of the solution in the Stomach is owing to fermentation, & we know that animal matters will sooner excite an acetous fermentation, & that as they proceed to fermentation they do this much quicker than Vegetables, for like these they run thro' the several stages of the fermentative process but are for a very inconsiderable time stationary; this may lead us to suppose that old meats are further advanced in degeneration, which causes a more quick and perfect fermentation, and this explains the more easy digestion of old meats. Some convalescent people & some chlorotic women can digest roast beef with facility when they cannot chicken, but of this Bryan Robinson's fact above mentioned affords the most curious & convincing proof. It is probable the Stomach is endued with a sensibility of the state

state of digestion & of the degree of fermentation, and this alone will explain a number of Idiosyncrasys— To apply it to our present purpose I observed that the Stomach was more stimulated according to the Saline matter of the diluent. From these principles you apply to particular elements.

Application of Aliment.

The cases where the Nutrientia are to be employed are 1st a deficiency of the fluids in quantity, the supply of Solids will be here included. The deficiency of fluids may arise from external lesions, from diseases that cause evacuations. Other cases not violently evacuant but having the same effects, thus causes affecting the Assimilatory powers more than the Evacuatory. Another case is where the disorder increases the Absorption of fluids necessary to be deposited; this too is connected with Evacuation— These are the cases where an increase of Aliment is indicated. We must now consider the cases in which such an increase & application is contraindicated, the deficiency of the fluids remaining the same. On

In what cases is an increase of Aliment contraindicated? Hippocrates has an Aphorism to this purpose, Corpora impura quo magis nutrias eo magis ledas. I shall condescend on 3 or 4 cases where the body does not admit of an increase of Nutrient.

1. Where the Assimilatory powers are much weakened - this occurs in many topical diseases of these parts or in diseases communicating an ~~effusion~~ infection to them. In general we may conclude an imperfect Assimilation takes place when there is want of appetite. Nature has given us an appetite, a desire of taking down food which she often suppresses, & whenever she does so we sh^d consider it as an Indication of Abstinence. We have reason to think that appetite is a necessary consequence of finished digestion, & therefore the want of it implies a deficiency. Much more may we conclude this of the *anorexia* amounting to aversion & nausea. In these cases the throwing in of Aliment is hurtful; it is always bad to take aliment till the former is digested. Shall we never then force down food without appetite

appetite. There may be a flatulent state of the Stomach, where the distension giving a sense of satiety takes away Appetite; if we are sure of this the forcing a little Aliment will either expell or occasion the condensation of the flatus.

A 2^d case may be where the want of appetite is owing to a transitory affection of the Stomach. What these are I shall not explain, but certainly there are such affections where a little Aliment taken down will give greater appetite; in such cases without Appetite we may throw in Aliment. The 2^d case contraindicating the use of Aliment is where the disease occasioning the inanition or the defect of the fluids & wastes of the solids is still subsisting, and where this is the case we shall commonly find our labour will be in vain, & generally speaking the disorders in which a want of Appetite occurs are of that kind that would be aggravated by an increase of Aliment, and whether the disease is an evacuation or from a faulty assimilation we can by no means nourish the System till that is removed, but as before observed most of the causes of inanition as
weakness

weakening the system & affecting the assimilatory powers contradict the use of Aliment. This case particularly takes place when the cause of Inanition is attended on an increased Impetus which will be aggravated by throwing in Aliment, & hence this will aggravate Inanition. — such are the cases of fevers & evacuations attended with this, viz, increased Impetus of the mass of fluids.

A 3^d case where the circumstances occasioning Inanition depend on a laxity of the parts by which the Evacuation was made. Most part of the increased Evacuations depend on the Impetus of the fluids, but they may not depend so much on Laxity, for the parts may have their due degree of tension & yet be forced by an unusual quantity of blood in the system determined to a particular part; an overabundant Menstruation is frequent in the female sex, & depends on an increased impetus of the circulating fluids — but it may solely depend on Laxity, for a force of the propelled fluids not greater than in ordinary health may overcome the action of the vessels when in a relaxed state.

state, & thus produce an Evacuation. In these cases we must abstract from the Ingesta or we can have no hopes of the Vessels recovering their Tone; such is the case of some women who have excessive Menstruation & those which have the fluor albus which frequently Physicians have attempted to remedy by throwing in nutritious Aliment in order to compensate for the loss sustained by the Evacuation; but this serves only to increase the disorder as by such means you excite a brisker action of the fluids, and consequently encrease the disease. The first Indication is obviously to overcome the laxity of the Vessels by abstaining from any diet of a Stimulating nature.

A 4th case of Contraindication more strictly belonging to the corpora impura of Hippocrates, where the fluids are vitiated & communicate qualities to every thing taken in, as when fluids are in a corrupt state, & evacuations too quickly thrown out, & in this case we reject the addition of Nourishment, and while there is a fermentation renewing the noxious matter in the system 'tis to no purpose we supply fresh matter to it.

The

The hectic fever is a case of this kind, which we impute to the absorption of Pus, & this acts upon our fluids occasioning their evolution to a saline state which fits them to be thrown off by the Excretories; in order now to blunt the Acrimony of this absorbed fluid there is a quick absorption of deposited Oil both which tend to produce Emaciation & evacuate the body. - By the quantity of Oil taken into the system that state of the fluid is produced that necessarily requires it. There are the cases in which the Application of Nutriment may be indicated or contraindicated. When the Nutrientia are indicated as applicable it is obvious that the most proper of these are those of an Animal nature that have their saline matters least evolved; that are Gelatinous & least perspirable, these are best to restore Nutriment to the system. There are few cases however where the want of fluids occasions debility, but this debility is communicated to the Assimilatory powers, and the Nutriment must be adapted to the state of these. It must be accommodated to the state of these with respect to their strength and vigour, and

and as the Organs are endued with different ferments we can hardly imagine a state of Evacuation without weakening the Assimilatory powers, hence a more general & rule, to begin with Aliment most easy of digestion, & from this to the stronger & more nourishing. I think the common practice in such cases of having recourse to those Aliments that sooner fill up the System is improper; but the usual weakness of the System in such cases requires that this property should be dispensed with for the advantages of easy digestion - it is better to begin with weaker Aliment & increase gradually to the strong that we may accustom them to the debile state of the languiferous System as well as of the Assimilatory powers. This makes our consideration of Aliment useful & applicable - We observed before that the powers of digestion were not simply those of solution, but is more disposed to fermentation, and that fermentation that has the chief effect here is the putrefactive. The Vinous and Acetous contribute little to break down the texture of bodies, and Phenomena shew that this fermentative

fermentative stage is begun in the Stomach the many means are provided to check its progress & prevent its going too far; the Acids & other liquors obviously prevent this, & we find in weak Stomachs putrescent food is of easier digestion than accecent, and in many instances we have weakly Stomachs that reject any food liable to the vinous or acetous fermentation, while Animal food undergoes the easiest dissolution, hence in weak Assimilation putrescent foods serve better than Vegetables. — Vegetables are indeed more perspirable & less Stimulant to the system, but those Aliments are indicated that are soonest acted upon by the various powers of the System.

Our next Indication is to take off superfluous matter. We therefore proceed to our 2^d head

Absumere superfluum
per Prodentia.

This is merely inserted from a regard to the System. In this and former tables there is not a proper view of Indications — I have left out all the Chirurgical
except

except this for the sake of order. We cannot enter upon it without the doctrine of Uterus, and shall therefore pass over it to our 3^d Indication of obviating laxity

Roborare lacum
per Adstringentia.

I have set down the general heads of the remedies employed here, the Astringents, and this of strengthening the lac & weak solids is a complex consideration. The lacum here must be understood to comprehend the more flaccid solid as well as the more strictly lac, & the title is inaccurate as confined to the simple solid, for laxity is more frequent in moving fibres. I shall therefore take it in the larger view of simple solid & solidum vitium. In the simple fibre the causes of laxity & debility may depend on a certain delicacy on the Original Stamina; this is the debile tenenum of Gaubius. The tone of the simple fibre must depend on the state of the moving fibre, that giving the proper tension to the whole of the simple solid. Moving fibres on the other hand must depend on the tone of the simple solid - it is the same cause that operates in Elasticity, but in the

The moving fibre in a more perfect state, the means of tension are applicable to both all sorts of external Compression equally relating to each. A 2^d case perhaps comprehending the delicacy of original Stamina, is the different proportion of fluid and solid, that is the excess of humidity. This might be divided again into excess of humidity in nutriment and weakness of the absorbent or lymphatic vessels, or where watery fluids are effused round the solid parts. A 3^d case is want of Tension. In the solida vivum it may be Atonia & Palsy, Atonia where lacity & debility proceeds from causes acting on the fibre itself, Palsy when there is a want of energy from the sensorium. From this view we see the variety of Proberants that may be indicated. In pointing them out I shall insert the cases.

In the cases of Palsy the Proberants must be likewise Stimulants which may excite an influx from the sensorium — Atonia may depend on the lacity of the simple fibre, but more especially on the want of Tension. There are other causes which must be referred to want of Tension, from a defect of fullness and pressure, this then is to be cured by attempting the means of increasing Tension; it may depend on
exercise

exercise or too great heat, & then exercise & cold are the remedies. Simple Solids may have debility from the mixture of the fibre which may be owing to rest, therefore to be cured by Exercise - when from causes diminishing tension by restoring these again, it may be increased in cohesion by Astringents - the remedies then may be reduced

1. To Stimulants of w^{ch} we shall speak hereafter.
2. The means of Tension of which we spoke in our Physiology & Pathology.
3. Exercise.
4. Cold.
5. Astringents.

The three last we need only mention here, and first of

Exercise.

This I might have classed under the Potentia nocentes, but I should have given the good & bad effects of it. The good effects are these, by giving a natural flexibility to every part of the simple solid they give a greater mobility to the parts which depends on their elasticity & flexibility. The Elasticity being given, the flexibility & extent of Oscillation will depend on the motion of parts on each other. The extent of Oscillation and the

the greater activity of Elasticity given by Exercise makes it a strengthener. Our Nutritious matter must be applied in a fluid form. Powers must abstract the fluid & therefore increase the density of proportion of solid matter. The growth of the body is carried on by stretching powers giving extension which allows of the application of more matter, exercise is the chief means of nutritious matter being applied & in this very particularly strengthens that it favours application by extension & condensation of solid increasing their Elasticity, or other causes may occur, thus pressure from exercise is constantly pressing the vessels, the muscles vary the fluids & give further pressure, hence Exercise by giving pressure has an effect in separating superfluous fluids & thereby strengthening; by pressure the less adhesive fluids are expelled, & this gives opportunity for the solid parts to approach nearer each other, in consequence of this they are brought into a firmer more compacted form, the superfluous fluid is especially exhaled by heat; Exercise supports and perhaps encreases this, hence another means of strengthening the system. A priori these

Arguments

Arguments would lead us to suppose that Exercise strengthens & it actually happens so in fact. We said Exercise gives solidity to our fibres, that it is the chief instrument in increasing the density & strength of our Solids; but Exercise operates in another view. If you take the common view of Nutrition, if you consider the solids as a net work in which there is made an apposition of matter in the meshes of the net & that this matter becoming firm & compact diminishes the size of these meshes, i.e., nearly fills up their Cavities, & it is only in consequence of extension that room is made for the application of new matter; thus then we believe that the growth of new matter depends on the Extension of the fibre on the apposition of new matter condensing & increasing the bulk of the solid parts. This doctrine appears evidently if you consider the solids as organized bodies, that their primary constituent parts are vascular & that they are in their primary state previous to the apposition of nutritious matter a congeries of vessels. The minutest fibre that we can separate from the rest of our solid is evidently to the eye & by Microscopical Observation

vation made up of still smaller parts so that it is impossible for us to perceive the primary constituent parts of solids. Now the question is whether these primary parts are fibrous or consist of lamellae of cellular texture, whether they are organized bodies or inorganic concrement, supposing the cellular texture to be formed by the concretion of mucus and not a congeries of vessels; however this is they have fluids interposed and we observe them both under a fibrous & cellular structure; how these solid matters approach each other for the purpose of further accretion on the one hand, & how in certain cases, where an overfirmness & rigidity would be pernicious they are bent entirely separate & distinct, is a problem not of the most easy solution. The powers however adapted to this purpose are not always insuperable, for by pressure of the parts they come into close contact, hence an accretion & a density takes place in proportion to the pressure. The reason of Animals growing old is not so much owing to the increase of the density of the simple solid but from the parts not being kept in a lax state, and a rigidity ensues, hence arises the greater density of Arteries in the progress of life and particularly near

near the heart acquiring such rigidity as occasions frequent Ossifications, in these tendinous parts are formed from muscles degenerated, from a want of moisture in the parts they are brought nearer to each other & proceeding to actual contact accretion ensues which is more or less solid as the Animal is more or less exercised. We explained above the reason of the firmness of accretion depending on exercise depending on exercise; by the pressure on the parts the fluids are expelled, hence by the pressure the solids are gradually approaching to fill up the Interstices left by the absence of the fluids. A labouring man at 60 has a greater degree of rigidity than a man who has lived a quiet inactive life has at 80; Labouring men however will often live to a considerable age; when this rigidity or at least the consequences of it are obviated in them is what we have no data to explain, more especially so as rigidity soon brings on the Mors Senilis. Exercise likewise as a stimulus to moving fibres by impelling fluids on thro' the vessels, and however it does this it is by determining the Nervous power into particular parts. The facility of motion then in the fibres gives freer passage to the Nervous fluid, and

and by resisting loss they increase it's powers. It will then also increase the tonic power by increasing the influx from the sensorium. These are it's roborant effects but it increases the Momentum of the blood thro' the vessels and increases respiration; by this it occasions a more considerable distension of the sanguiferous system & thereby excite their action & encrease the circulation in the extreme vessels. These are similar to the extremities of the Chord to which our stretching powers are applied, & hence it will have a considerable effect in increasing Tension. This relates to the effects of Exercise on tension & strength, it's influence however is more extensive, it increases the several secretions and excretions, promoting the increase of the Salutary & active in expelling the noxious from the system, hence Exercise is fitted to maintain the purity of the fluids as the strength of the solids. These considerations will be sufficient to show that it is the chief preserver of health and a remedy in many diseases. But it has it's limits; it may prove a potentia nocens, from it's increasing the impetus of the circulating fluids, and whenever these are preternaturally increased it may be attended with the most pernicious effects.

effects, and in all cases where there is already an impetus ductus as in fever, hemorrhagy, increased excretion whether depending on an impetus ductus auctus or a debility & laxity of the vessels effusing the excretions into cavities, here exercise would be highly detrimental. In a person affected with an hemorrhagic flux we cannot expect that Hemorrhage to stop without a total cessation of all exertions of the body, an unusual state of rest is here necessary. This leads to a particular application in all cases where the body is weakened & the fluids are pushed off too violently, the effects of exercise cannot be attempted but by slow degrees, & the effects of it appear after a considerable length of time.

Exercise is of all others the most powerfull deobstruent but any additional extension must be produced very slowly in the system; begin by gradual means & increase to a suitable degree as the circumstances of the patient will bear; it is better to do it by gentle repeated impulses than by a considerable force at once. We observed the Impropriety of its use in an Impetus auctus, and if there is any exception to this it is where there is a determination to a particular part, which will

will be taken off by exciting the circulation in general. The bad effects of it are more considerably seen in the overstraining of particular muscles, the excessive contraction will likewise be attended with the same effect, but the operation of neither has as yet been fully explained.— When the Secretions are stopped it may be an useful remedy, but the limits will be especially applicable to its diobstruent effects. From the last consideration it is necessary to distinguish between Exercise & the motion of the body. Exercise is divided, 1, into the motion of muscles, as all kinds of labour, watching &c, and, 2, into that motion which requires no exertion but where the body is moved by external impulse. A more frequent exertion of Muscular action will have all the effects of strengthening the simple solid; but it is likewise exposed to bad effects to induce a debility by overstraining, by urging the frequency & force of the circulation, & we might shew that the Impetus of the circulating fluids urged improperly only excites Spasm & Contraction, which makes constriction more considerable. Our system does not admit of Exercise for a long time, for whatever increases the energy

of the sensorium if continued brings on a tendency to its remission, & therefore if too much continued it gives lacity & debility. From what we have said the limits of Exercise will appear, especially it will point out the difference of Exercise. Exercise of voluntary muscles or bodily exercise will effectually weaken the sensorium, & by stimulating the circulation it will be more apt to give an excess of this, on this account are the cautions in the use of exercise as it is difficult to obtain its good effects without hazarding the bad. When we want to increase the determination to the surface when the determination to the Internal parts is more than ordinarily increased, as in hemorrhagic affections which are often determined to particular parts of the System, to particular organs as for instance topical congestions frequently occurring in the Stomach, Lungs, the various viscera, & Alimentary canal, these are extremely dangerous, & we could wish to alter the determination by such a powerful Diaphoretic as Exercise, but this cannot be done for reasons already given, we therefore substitute gestation which has excellent effects. I knew a person
who

who went a Journey in a Carriage for a Spitting of blood, which, tho' at any other time constantly upon him, yet during the subsistence of the motion of the carriage entirely ceased, but if he for one day intermitted the gestation he had a relapse till however a proper perseverance entirely removed his Complaint, Exercise then may be divided into

Bodily Exercise, and

Gestation—without muscular action.

This admits of a further Subdivision

Of Gestation by Sailing, and

— by various carriages.

The effects of this latter kind of Exercise perhaps, appear more evidently in Sailing than in the other species; ~~which~~ may be the explanation of these more powerful effects of Sailing is not yet accounted for by Physicians; perhaps its mode of operation may be different. By the increase of action in the Arterial System the determination to the surface is increased, and if we could so procure an Exercise that would operate solely on the Arterial System, it would further increase the determination to the surface; but the difficulty is that the Arteries are collected

solicited to action by every circumstance, by the smallest degree of exercise. If a body is carried by the motion of another, it acquires the same progressive tendency with the body that contains it, tho' it may remain at rest, but if it is loosely connected with the other parts, & the vehicle should stop the determination to motion remains in the body carried and therefore it will pass on, as in the case of a number of Balls in progressive motion on a table likewise in motion, altho' the table should be suddenly stop'd & deprived of it's motion, yet the Balls still retain their momentum, but the common instance is, a vessel filled with water to the brim moved on a table or any other body, & moved about with a pretty rapid motion shews no tendency to run over, but as soon as you deprive the table of it's motion the fluid flows over. I consider the fluids in the vessels to be in the same condition under the progressive motion of the whole body, there will be in gestation alternate stops & accelerations & then the fluids are gently pushed to the sides of the vessels, and this excites

excites the action of the Arteries separately, for it cannot excite the action of the Venous System, hence it will be instrumental in promoting the exertion to the surface; hence appears the difference between Gestation & bodily exercise & the effects of the latter in particular diseases. It is probable that by increasing the muscular power they give a gentle & very usefully deobstruent impulse to the vessels, for in every variation of the velocity the arteries will receive a gentle Impulse of fluids. In diseases we are to consider the properties of muscular motion in the various species of exercise. In a Phthisis when a vessel of the Lungs bursts & Inflammation & Suppuration come on we would suppose any increase of motion hurtful from Theory. I suspect Sydenham pushed the matter of riding too far in Consumptive cases, for they require the slightest gestation. A Physician of Eminence was of opinion that Sydenham killed more than he cured by riding. This objection will certainly hold against violent riding, or a hard going horse, as all bodily exercise is hurtful in Phthisis; but it does not lie, against
against

against gestation or riding properly conducted & especially sailing. I have known a person have almost a constant Hemoptoe upon him tho' lying in bed, who had it stopped by sailing a few days, & where a Phthisis does not depend on tubercles but on a plethoric state of the system or congestions in a particular part, then a proper regimen & gestation will easily perform a cure. —

Of Cold.

I had occasion not long ago to consider this, particularly, I now resume the subject with certain restrictions, here confining myself merely to consider its strengthening effects. Cold operates by condensing our solid parts, in bringing parts closer together & by giving them a firmer adhesion, and in this way it strengthens the simple solid, but from the generating power of heat in the system cold has but little effect, it operates but very slowly & is applied only to the surface in contact with a small portion of our solid matter, and the effects of cold merely as acting only on a small part

against part of our solid matter by a condensation of simple solid amounts to but little; however as our system depends much on a state of tension in producing this it may have pretty general good effects. Cold by acting on the moving fibres acts more readily than by condensing the fluids, but we must not however refuse this latter. In so far as cold may have effect in condensing the fluids, & thereby give rise to the contraction of our elastic solids, for fluids acting on solids & very much distending them, they will give an opportunity for the solids to contract & acquire a closer texture. Cold acts on the nervous fluid & increases its density, its effects on the sentient system are stimulant, exciting thereby Muscular contraction, whether it makes the muscular fibres contract is doubtful, but in circular fibres which have moving antagonists it readily contracts them. From all these modes of its action it certainly constricts the surface, and this is propagated over the whole system in which tension is much connected; for its constriction on the surface is communicated to the subjacent vessels, and

and from thence extended to the whole, therefore we find the whole sanguiferous system is excited by Cold, & these effects will account for its effects in promoting perspiration &c. The condensation of the nervous power is in some measure propagated over the whole system, cold partially applied produces a general affection, thus a hand in cold water occasions general horripilation. Whether this is owing to a change of Tension or Stimulus communicated by sensation is difficult to say. This seems connected with the sense of cold merely, thus it happens from the sensation of cold when the Thermometer shews the body to be under the natural state.

We said before, Cold acted as a Stimulus, & it excites the contraction of the moving fibre to a considerable degree. This stimulus is first applied to the Extremities and from thence communicated to the other parts of the system, & from the adjacent vessels near the surface of application it is communicated to the Arteries & promotes their action into the excretory vessels; hence its action is analogous to exercise being a chief means of promoting

promoting the secretion by the skin, and Exercise is never so efficacious in promoting perspiration as when there is an application of cold to the body at the same time. Boerhaave alleged that walking was one of the most powerful Diaphorotics, in this there is a conjoint motion of Exercise & Cold upon the System.

We yesterday considered the effects of Cold, we mentioned it's effects in condensing the Nervous power, & giving occasion to the contraction of moving fibres, besides this Condensation of the Nervous power it has likewise the effects of a Stimulus - we suppose it indirectly excites the Nervous influence & produces a more considerable contraction of the Muscular fibre - it constricts the surface of the body, & this is propagated over the whole System, but while it acts indirectly as a Stimulus, both it's primary & secondary effects as a Stimulus, is to excite a more forcible action of the Sensorium, and occasion a reaction or increase of it's energy which ~~it~~ determines the heart to a more vigorous action, this is chiefly directed to the surface because

cause that was the part where the Stimulus was applied - The operations of cold in strengthening the system are sufficiently obvious, & from these views it is easy to perceive the application of it in various diseases, but the administration of this as a remedy is attended with difficulty, & must only be made use of in certain degrees of cold - I before have observed that the motions of the system are more directed by final causes than we could explain from the nature of things, hence cold in its first application occasions a reaction or increase of energy which obviates the tendency of cold, and this not only gives a considerable degree of tension but is also a most powerful invigorant to the whole system. It is only in certain degrees of cold that we obtain its good effects, for if its intensity is considerable its stimulating effects will produce a reaction of the sensorium that shall perhaps be hardly sufficient to counteract its effects on the nerves, hence that system will be entirely overpowered, & it will produce a great degree of Collapse, sleep, & at length death.

Ino

In certain circumstances cold operates in producing a constriction of the moving fibres to a spasmodic degree, so as not to be overcome by the reaction or the increase of energy from the sensorium / in consequence of the stimulus of cold applied / & here a reaction of the system is produced that is extremely hurtful & precarious, for it occasions a spasmodic constriction on the extreme vessels & hence a fever ensues. It is obvious that cold by it's sedative power & it's action on the extremities may be pernicious, for in proportion to any degree of constriction on the surface of our bodies there is a great determination to the Internal viscera. Cold therefore if too intense applied to the surface may do harm, & in all cases where topical congestion is indicated the use of it at any rate must be abstained from. 'Tis for us to observe in what cases the salutary & in what cases the noxious effects take place. — The Tonic power of the system depends on solid matter of the Nerves and especially the ether. If the Elasticity is increased with greater variety it does not answer the purpose

pose for this gives debility; there must be a certain balance of density & elasticity from cold, & therefore the most proper temperature of our body is much above that state of air which we find most necessary and agreeable, hence any increase of heat tends to lessen the generating power that is to destroy life; hence we are so universally refreshed & strengthened by a temperature of air much below that of our body, the enervating effects of warm chambers, seasons, & climates may here be understood. To understand it's application recollect a former Doctrine; the contractile powers I mentioned might be hurtful & it's sedative powers pernicious; therefore if cold is not succeeded by it's stimulant effects, or by the active powers of the system it proves hurtful. We readily bear a considerable degree below our own temperature, but if greatly below it must be very transitory to be safe, for it's effects upon the system seem to be proportioned to the duration of it, for a man can plunge his body into water at the temperature of 32 degrees, or the freezing point, with impunity provided it be merely transitory; and a man immersed in water at that degree

degree is warm under the water in comparison to what he is in the air or immediately coming out, hence the duration & intensity may be a means of increasing the degree of cold. In all cases where the energy of the system is considerably weakened, then Cold on its application is liable to proceed to the Spasmodic degree, & in that case can hardly be overcome by the reaction or increased energy of the system. Another case is that the effects of Cold as a Stimulus seems to be in proportion to the sensibility of the system, as in different temperatures of the body it produces different effects. We have many instances of the bad effects of Bathing when the body is unusually warm, or we frequently see the pernicious effects of cold liquors drunk under the same state of temperature. We find it difficult to determine what are the circumstances of the body when heated that renders the application of Cold dangerous; it must be then under some peculiar Influence, for I have seen various instances of people kept a long time in a great degree of heat immediately plunges themselves into a river & escape with impunity. In England it is very common immediately

diately after a chase to turn a horse into a pond; this shews that cold is relative to the sensibility of the system; perhaps it may be explained by supposing that in some circumstances when the body is heated it is also invigorated by exercise, but it is a very difficult thing to determine when the body is invigorated by exercise & when not, so that the application of this remedy under such circumstances must be uncertain. The Antients alternated the application of heat & cold, they plunged a man into a cold bath on immediately coming out of a warm one, & in fevers cold bathing was often provided as a remedy, & it is in Europe at this present by no means an unfrequent practice. What lights have we lately received relative to this in the small pox where the application of cold is extremely favourable to the cure? and in the East Indies nothing is more common than for them to bathe their patients in this disease, & from many instances we know they may be exposed to cold with the greatest safety; therefore there is no general rule than when the body is considerably above its ordinary temperature we should not apply cold, but to its proper application we must understand the state of the body more accurately in

accurately in these cases; where fever depends on a loss of tone the practice has been frequently & successfully used, and we may venture to restore the due degree of Tension without inducing Spasm or too much weakening the system.

Astringents.

These are a class of medicines whose operation has hitherto been involved in obscurity. They act on the fluids by Coagulation, & hence it is inferred they act on the solids as being much of the same nature, and formed as we said before of a coagulable part, viz, the Lymph. The substances that principally act on the animal fluids are Acids, Alcohol, heat, & cold, but the two last never take place, nor can they produce their action compatible with the life of the animal, therefore we shall omit the consideration of them. Besides Acids & Alcohol there is a third substance, the Styptic.

Alcohol. —

The power of this in Coagulating the fluids & manifestly hardening the solids is well known, therefore with propriety ranked under the title of Astringents. It is obvious that it has other powers joined with it besides its

it's coagulant; in some cases of it's application it proves strongly stimulant, & in others strongly sedative. — It's action is chiefly confined to the external surface, it constricts the ~~article~~ strengthens cicatrices, ~~and~~ but it's astringent effects cannot reach deep; as a remedy, it's coagulant, stimulant, & sedative effects combined, render it's application not very frequent. I know of no other use of astringent medicines than merely to harden & constrict the surface, their coagulant & hardening power is confined to the simple solid & the fluids, to the moving fibres it acts as a stimulus & sedative.

Acids.

These coagulate fluid substances & harden solids as is proved by Experiment. In the painless arising from the application of $\frac{1}{2}$ to the lips the effect may be dubious, whether is it owing to their stimulant or astringent power — but in other cases it is clearly astringent. Where the astringent then is probably a diminution of activity in the nervous fluids they then act as sedatives, but in a certain state they dissolve animal substances and stimulate more than astringe. In their concentrated state they are highly

highly corrosive & as such are powerful Stimulants, but to act as Astringents they must be employed in a very diluted state. In Paralytic cases we can discover their stimulant effects, their operation on the Nervous power being far more considerable. Both Acids & Alcohol have been reckoned powerful Astringents from their stopping hemorrhages; but this is rather found to proceed from their property of coagulating the fluids & thus forming Thrombi in the mouths of the patulent vessels than by constringing the Solids. Acids when not perfectly neutralised, but are highly concentrated, do still retain the power of coagulating fluids and are yet astringent. Alum for instance in which the Acid is not perfectly reduced to a state of Neutrality coagulates fluid substances & constringes solids, whereas other Absorbents which give a more perfect saturation are not Astringent. This brings us to our next head of

Styptics

This head is difficult to explain, they being of various natures. Many we can mark out depend entirely on an Acid but not in its separate state, when an Acid is joined to an earthy substance and the union

is not complete one of the mixts being in larger proportion the Neutral or tertium quid retaining still the properties of the predominant substance which in Allum for instance is an Acid, & this is the only Styptic absorbent matter I am acquainted with. This has led Gaubius & others by a false analogy to the supposition that every Combination of an Acid & an Earth is Astringent; perhaps this may be the case, but if it is so the Acid can never be entirely involved or the neutral be entirely deprived of the properties of each of the Mixts which they possessed previous to their mutual application. So far as I know there is no earthy Neutral that is Astringent; all these on the contrary prevent Coagulation, rather dissolving the texture than acting as Astringents on the fluids & solids. Many of them applied to the blood preserve it's fluidity & keep it from Coagulation by producing a contrary effect, viz, the Dissolution of it's parts. — If it has been imagined that Neutrals are useful as Astringents it must be by a refrigerant power like Alkaline Neutrals. Most Metallic Salts admit of various Saturation like Allum, they unite with the Acid & reduce it to a concentrated state, as thus partially saturated with Acids they coagulate fluids (and

and may have Astringent effects, whenever the Composition is not at the same time attended with powerful Stimuli, for when it's stimulant power is great, it's Astringency is not perceived. The Astringency alone is brought about by Acids with lead or iron. Metallic matter either admits of Astringency or gives so much stimulus as entirely to exclude it. We find some degree of Astringency in Silver, Antimony & wherever the Astringency is not obliterated by a corrosive or stimulant power. A mixt operation both with gold, Copper & Zinc partakes both of a Stimulant & Astringent power. Tin & Arsenic have not yet been sufficiently explained. The Astringency of Tin seems to be in some measure proved, but as there is always a quantity of Arsenic joined to the Ore of Tin we cannot determine how far it is combined with the great Stimulus of Arsenic. So far then Astringency depends on an Acid in Alium or Metals & on further Examination we shall find Acids always to enter into the composition of Styptics. A 2^d set of Styptics are the Vegetable Acerts in which the Acid is united with other Substances whether earthy or not is not as yet ascertained. Their Acid is evidently covered and we only know that it is Acid infused in a concentrated state

state in solid matter & hence to be explained on the same principles. Many Vegetables are to be ranked here that have a manifest Astringency but shew no Acid evolved, & are distinguished by the title of the Austere. When we see by a certain progress in ripening how easily the Acerb pass into the Austere we are led to think here too an Acid is combined with some earth. Whether we may hence conclude that Acid is the foundation of Stypticity wherever observed, deserves farther enquiry; but we would not conclude rashly, for perhaps the Metallic Substances have effects as well as acids, since we know that Metallic fumes have a power of condensing the Nervous fluid & destroying it's mobility as in Paralysis. The Vegetable Austeres are known by their absorbing Acids from Metals, thus they precipitate a solution of Iron in an Acid in the form of a black Lake, & hence good in making Ink. This attraction for Acids seems to be against our supposition of their containing it, yet it is a vegetable Acid & therefore can be dislodged by a fossil Acid. - So far Astringents owe their effects to an Acid but yet do they operate on our simple solids but not perhaps considerably. Now the question that
arises.

arises here is concerning their mode of operation whether they operate only by abstracting the water from the ~~their~~ solids & by this means give opportunity for the parts of an animal to concrete together more firmly. It is probable I think they operate by the Acid abstracting the water from our solid substance; but in this I would be cautious, for the Astringency may not be owing alone to the Acid, the other matter combined with it may probably have the same effect. Astringents of all kinds produce sedative effects on the nerves & destroy the Mobility of the Nervous System as we mentioned in the case of Metallic fumes producing paralysis; by this consideration of the nature of Acidity I have pointed out its operation on the simple solid, but its action is much more considerable on the Nervous System. I could offer some objections to shew that their operation on the simple solid is inconsiderable, from the small part of the simple solid they can possibly be applied to; but many circumstances and facts ^{are} adduced in order to confirm the considerable degree of astringency in Astyptics, but these facts are not very satisfactory — they produce the instance of Tanning leather where Astyptics are employed but there is no great probability

lity of their having any great effect - there is some-
 thing else concurs in giving density to leather, and in
 this application of Astringents they are quite in contact
 with the leather, hence the great care of scraping off
 the oil, cellular texture, &c. from the skin. If we could
 only determine their effects on the simple solid we
 should find them of little use, but they operate on our
 sentient parts, & their effects here are considerable
 as their action is not merely confined to a particular
 part, but they may be communicated to a consider-
 able extent, thus a single drop of allum or of saccha-
 rum Saturni applied to the tip of the Tongue, its effects
 will immediately be extended & a degree of constrict-
 ion will be propagated over the whole external
 mouth & membrane of the fauces.

So far Astringents operate on the Nervous system,
 but even here their effects are often inconsiderable,
 from the application not reaching the nerves freely
 because of the Cuticle's being interposed between, and
 indeed in all external applications they can only
 operate where the Cuticle is thin, as in those tender
 delicately covered parts the eye the mouth & fauces
 whose Epithelion is extremely thin & of course the
 application to the Nerves is much more direct, and
 the

the sensation is easily communicated. — But besides their want of penetration there is another circumstance that considerably diminishes their effect, & this is a defect in their Administration that is indeed unavoidable, for we know that the action of bodies in a dry form is extremely inconsiderable and in order to facilitate their action we must apply them in a fluid form, hence all our impregnated decoctions partly from their mode of Administration & partly from their indirect application have little effect, the fluid acting in all probability more powerfully as an Emollient than the Impregnation as an Astringent.

The Theory of their internal operation is difficult & we cannot suppose that the small quantity given can be carried topically to the vessels affected. If they really stop Hemorrhages it must be by their topical constriction propagated to other parts. The Stomach is the most proper part for this purpose as greatly connected with the System, it is probable that the Vegetable Astringents act merely in the prime *via* & little on the System in general, the fossil again as the Metallic Astringents are much more

more extensive in their action. I must take notice here that there are Astringents considered as tonics & roborants that have no degree of Stypticity nor contain any Acid in their composition. I hinted before that Astringents were sedative, & upon this footing the Metallic have been called Narcotic, their action is different from that of the ordinary Sedatives, but have an operation sui generis which remains to be explained. Sedatives often give such a constriction as prevents the recurrence of Atonia that would occasion Spasm.

This leads to the consideration of Peruvian Bark whose action has been with seemingly propriety referred to Astringency, as Astringents have often produced the same effects; how the bitter can operate as tonic is not well explained. May we say that as in Metals so in bitters there is a sedative power imitating the effects of Astringents, by condensing the Nervous Power they might certainly be brought under the head of strengtheners could we reduce their operation to one system. From Astringents being generally Acid their action might be referred to a coagulant power, yet one difficulty remains. Bitters are universally allowed to strengthen, the question is are they Astringents or do they act

act otherwise, their other action is not explained. To suppose them Stimulants is insufficient, & to suppose them Astringents embarrasses the Theory we have given. They contract the simple & moving fibres particularly the latter, and by increasing the Tonic power of Arteries it will be understood how often they are invigorating, & as increasing the Impetus in the Extremities prove aperient & deobstruent. This explains their action sometimes as Astringents & sometimes as deobstruents. In Hemorrhages their operation is doubtful; from Theory we should suppose when Saccharum Saturni is given internally it is alleged in fact to stop Hemorrhagy, it is difficult to imagine that the Constriction occasioned in the Stomach should be propagated to these vessels without affecting other vessels of the System. This gives a suspicion that the operation of Astringents is not by propagating Contraction, but rather by a Sedative power. We can more readily admit that such a power applied to the Stomach will especially affect these parts in a higher degree of Excitement, & therefore the Vessels affected. In practice whatever Theory is adopted, the cases & circumstances when they are applicable is doubtful. If Hemorrhages are more passive, then we can see Astringents directly indicated, but this is

Styptics

is more rare, for Evacuations generally depend on increased Impetus. Are they here applicable? As far as Tonics & strengtheners they are hurtful; but suppose we carry this dose to such a degree as to bring on Constriction, it is doubtful when to apply it in an Evacuation depending on an increased Impetus. If it immediately threatens life we may hazard the stopping it, but if moderate we only stop the determination of the system, which gives rise to more violent disorders. These difficulties have embarrassed practitioners. The Shakians, as supposing that almost all Hemorrhages were exertions of the Natura Mediatrica, refused the Applications of Astringents except in extreme danger. But I can imagine a case of increased impetus where they are useful. All these causes perhaps act by Exacerbation, e. g. in the cold fit of fever, a bleeding at the Nose often comes on regularly, & entirely goes off on the approach of the hot fit; here the taking off the Exacerbation by Astringents prevents the increased impetus that gives rise to Hemorrhages. Hemoptoes are often stopt by Bark & Astringents, but how these bitters give Astringent effects is difficult to say; perhaps it is like the operation of Metallic Substances by condensing the

the nervous fluid & diminishing Mobility. I have known this Evacuation to return by regular Exacerbations, whenever then the Hemorrhagy returns periodically by remissions & exacerbations Astringents are proper. This periodical motion is not so obvious tho' the fact is to be regarded. In the uterine Hemorrhages & even in the fluor albus these Exacerbations are often obvious, & if these are properly observed they will be found to be proper cases for the Administration of Astringents. In Evacuations of great laxity Astringents as diminishing Mobility may be proper, but as in even lax Evacuations there is always some degree of increased Impetus which renders their use in some measure ambiguous. I have one other Speculation to offer which is new. Several vegetable Styptics absorb acids & hence decompose vitriols, it is probable many of their effects on the human body depend on their Astringency, they may absorb the Acid in the prima vie, & this will affect the Composition of the Animal fluids by preventing the necessary quantity of Acid uniting with it, & hence may alter the secretions. — A remarkable fact necessary to this subject is that calculous complaints are often relieved by alkaline & absorbent Earths, & likewise by Styptics.

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the only common effect between these is the Absorption of Acid, & it is only on this consideration that we can unite their several effects; but all these give relief without dissolving the Calculus & therefore must act otherwise; they may do this by their effects on the Alimentary Canal, for Alkalies cannot be taken in sufficient quantity into the blood to produce any effect, they perhaps never go far as the Pridonies in their proper forms.

Our next Indication is

Sacare rigidam per Emollientia.

This you may think might be considered entirely as a converse of the former, but in the case of relaxation it is obvious that the several means of relaxing rigidity of moving fibres will come under the *Pedantia* & *Antispasmodica*. I shall here then confine myself to the relaxing the rigidity of the simple solids — the means employed in the *Materia Medica* appear numerous; from a near view it will appear that the relaxation of the simple solid is to be referred to water, Mucilage, or Oil — Certain matters dissolving solids might be subtly supposed to be applied in such

such a low degree as to relax. I do not see the foundation of this. In the Animal mixt we can observe little else than the proportion of humid and dry, the humid mostly water, the mucilage and oil less powerful but more durable, these perhaps owe the relaxing effects entirely to their containing water, & the explanation of this will make the others clear and on this account I shall chiefly confine myself to the consideration of

Water.

This relaxes the simple solids by being insinuated into their composition, & may be there in various proportions, & according to these more laxity or rigidity prevails. That water or aqueous moisture relaxes the simple solid appears from Bryan Robinson's Expts. He tried a great variety of humid Impregnations, & many Astringent substances, & in all his Experiments no Astringency appeared, on the contrary there was always a greater Extension in the fibre (or the hairs in his Experiment) when these were applied than when in their dry state. It is not easy to induce Astringency by the application of watery liquors, & the Astringent effects on the simple solid are inconsiderable

=able, if they do act it is on its sensibility on the Nervous fibre. Bryan Robinson in his Paper takes a fibre perfectly dry & extends it to a certain way & applies different fluids to it, then examines the increase of Extension; when he however speaks of strengthening fluids he means relatively to other fluids; his various Impregnations of water gave less extension than water alone, perhaps the other substances may prevent the insinuation of the water & render it less powerful as an Emollient; few of his fluids relaxed so much as water cold, but no fluid acts more than warm water except the Acids & Alkalies which corrode & destroy the texture of the parts. I would alledge then that water is the only proper Emollient, at least it is the most powerful, & this combined with the next greatest relaxing power in nature, heat, is productive of the greatest effects.

Warm Bathing.

Bathing is to be considered as the application of two relaxing powers Water & Heat, here the heat may be supposed as assisting the power of Menstruum. Its separate effects will be considered.

1. Warm Water as suited to relax & dissolve Animal matter

matter, is suited to deterge & keep clean the surface of the body, without supposing any insinuation of it thro' the Cuticle; it serves to prevent the drying effects of Air, & the mucous secretions, the unctuous & sebaceous matter remaining on the surface which often remaining on the surface & entangling dust, &c. form firm concretions on the surface & prevent the escape of Perspiration. We see then merely by it's external effects the whole surface of the body put into a more relaxed state and the secretions removed, for these latter by turning Acid or keeping in Acrimony, they gave rise to various cutaneous disorders, for most of these depend on certain accumulations on the skin which congregate, and therefore these may obstruct perspiration like other filth, and by stagnating in the heat of the human body may become Acid & produce various other effects. This then is a continual operation of the deterging power of warm bathing, for preventing & curing several disorders, & by facilitating the escape of vapour affecting the whole system. Water by the assistance of Heat insinuates itself into the solid substance and relaxes it greatly; but whether does it penetrate beyond the Cuticle or not? I think it may, between that

Warm Bathing

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that the rete mucosum, but further than this it has no effect, because here is an oily & unctuous fluid interposed; it may enter indeed by the Absorbent vessels & may give a greater degree of laxity to the whole of the Cutis, but cannot be diffused in a sufficient quantity to produce any general relaxation, but it is taken in & operates as a Diluent. It however may have great effects by relaxing the Cuticle - every part of our solid matter is continuous with every other part of the System nearer or more remote, and to these a certain degree of Tension is given, & from the connection of Tension in the System we know that the tension of the whole must depend on a due tension of particular parts & hence a change in these affects the whole. This will be especially considerable when taking place in the extensive covering of the Cuticle. The relaxation is always in proportion to the degree of Tension, and this will be in proportion to the Vicinity or remoteness of the parts, it may be extended to the Ligamentous fibre, & it can be explained how the rigid tendons & ligaments can be relaxed by water applied to the surface, not in actual

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actual contact with it, but by taking off the rigidity from the incumbent parts the effects are communicated to those parts that are subjacent, & if we consider the innumerable Ramifications of Vessels interposed we shall soon see the extensive fund of Communication to the other parts. The effects of relaxation will likewise be more considerable when we consider that under the Cuticle Millions of Nervous fluids are expanded, these are more or less relaxed & tightened according to the state of the Cuticle. The Tension of Nerves in the Organs of sense has a considerable effect on the general System, the relaxing then of the Cuticle relaxes so many Nerves. Heat likewise relaxes the Nervous System by rarefying the Nervous fluid, & the relaxation being extended from Continuity it will affect in some degree the whole Nervous System. The heat commonly applied to the relaxation induced becomes an agreeable Sensation. All pleasant sensations perhaps give some degree of Relaxation to the Nervous System by drawing off the Nervous fluids from other parts to the extremities affected, thence a considerable resistance is taken off from the constant energy of

of the Sensorium, & even taking off it's Excitement. — Phenomena shew that the Sensorium is not only irritable by the various means of impulse, but by every resistance to it's free motion, for it is evident that from a certain degree of resistance to the due energy of the Sensorium, it is irritated and anxiety, delirium, & restlessness may occur. Bathing then by it's effects may take off the excited anxious state & induce Sleep; this must be the explanation of it's soporific effects in many febrile & other cases. Cold in the extremities prevents sleep & brings on a Constriction on the lower extremities which may often prove a cause of delirium, warm bathing by taking off the resistance or constriction immediately relieves them & brings on Sleep by a diminution of Excitement in the Brain. These are the effects of warm bathing on the simple solid & nervous System, it's effects on the Sanguiferous System remain to be considered.

The relaxation communicated to subjacent blood vessels make them admit blood more readily, hence the taking off tension & resistance from the Arterial System. — We have hitherto spoke ambiguously concerning Bathing. The water has been supposed to enter a considerable way

Warm Bathing

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way into the body, but this is difficult to imagine, & especially is unnecessary, when our explanation extends to the most deep seated parts of the system, as the ligaments & bones, & from the Abdomen it's, relaxing effects may be extended to the contained parts.

It is now time to observe that the Emollient effects of Bathing are attended with others that do not always concur in the same effect, and these are dependant on the degree of heat that is employed.

Under considerable degrees of heat long applied we find that it rarifies the blood, occasions turgescence, & is therefore improper where the impetus of the blood is in excess. It has been supposed then to hurt as much by it's stimulant as to do good by it's emollient effects. The ill effects of Heat then are

1. To rarify the fluids which increases Tension and this proves a stimulus.
2. Heat Stimulates moving fibres, hence increases the Impetus of the fluids, & therefore hurtfull in an Impetus Auctus.

Two ways of compounding this matter & obviating the bad effects.

Warm bathing

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1. As all the effects of rarefaction & stimulus are applied to the surface they will have less effect.

2. By applying the water below the temperature of our body, and this will relax without stimulating. Water applied above 62 deg^s will stimulate the body & at first increase the generating power, but there is a difference here between the application of warm air or vapour & liquid water of the same temperature, the latter will have much greater powers in cooling than the former, because water as much more dense will take off the heat of the body in much greater proportion, & hence perhaps water will give most of the relaxing & less of the Stimulant effects. The Stimulant powers indeed are often considerable but they are mostly of the softer kind as connected with relaxing powers.

The Stimulus indeed may sooner take place than the relaxing powers, but if these are to be so tempered in continuance & degree that the Stimulus is less than the heat of the body, the relaxing effects may still be more powerfully obtained. The Stimulant power is more transitory than the relaxing. I have found the heat of the body greater in a warm bath below the temperature

ture of the body, & after coming out the heat was even less than ordinary. This is only to be explained from the relaxing effects being more permanent than the stimulant. I formerly condemned the practice in some countries of using the bath in hæmoptoe, but I have since heard that it is extremely useful, and its use may be explained from what we have said; it may be applied likewise in other Inflammatory disorders when we can make its relaxing effects much superior to its stimulant, & by determining more considerably to the external parts, it may compensate its effects with regard to the internal. — The continuance of bathing is yet doubtful, if below the temperature of the body, it may be continued long & yet give us the relaxing in greater proportion than the stimulant effects. — The weakening effects of it are dubious; the ancients used their baths freely, & the best Information I can get from countries where it is now used confirms the opinion that it has no weakening effects.

These are all the effects of warm bathing in relaxing the simple solids in consequence of the communication to distant parts by their Actions on the Nervous System.

it acts on the cuticle is then communicated to the subjacent parts and from thence to the more internal. In many cases where we perceive it's good effects that we cannot attempt to explain by any contiguity, but must be referred to the universal communication of the Nervous System. This explains it's use in relieving the pain from the Ureters in consequence of their dilation by calculi, & likewise in dilatations of the Biliary ducts by concretions, from the inconvenience of administering warm baths intestys we know this practice was omitted, & Opiates, blisters, & bleeding were substituted in it's stead but without effect, recourse was obliged to be had to the warm bath which immediately relieved them, by a single Immersion. We next consider the Indications belonging to the moving fibres. These are

Circ Motum per Stimulantia.

The Indications in moving fibres are with respect to diminishing or exciting motions. I shall limit this subject, for to bring in the various means for exciting the motions of the system would be to comprehend the whole Materia Medica. I think it however

however necessary to give a system on this subject.

The motions in the Animal system may be increased or diminished by various means, reduced to the two heads of direct & indirect Stimuli. As the motions may be diminished by powers producing excess of action, this excess or degree of excitement is productive of a proportionable collapse, and these motions are not produced by direct Stimuli but by powers whose first tendency is evidently to diminish the motions of the system, but are afterwards followed by Stimulant effects. These are what I call indirect Stimuli, & are sedatives as these last in their first action produce a state of Collapse followed by a state of excitement. These give a state which from the laws of the system occasions a reaction of the Sensorium which is more especially directed to the sanguiferous system, & hence gives the case of pro-
per fever under certain causes - here I shall decline considering indirect Stimuli, tho' it is true the exciting of Fever has been reckoned a remedy, but I neither can condescend on the cases where fever is truly indicated, nor do I know how to manage the
cause)

cause so as to excite fever at pleasure & in a proper degree. When there is a predisposition we can excite it artificially, but we cannot employ its ordinary cause or other means to excite it, or much less with any measure of heat that we can command. We shall therefore leave this curious subject and limit ourselves to the action of direct Stimuli. These may be distinguished into two kinds—1. Into those powers that excite the Action of the Brain & Nervous System, & 2 into those that act on the moving fibres, especially the Sanguiferous system. It is impossible for us to separate these effects of Stimulus, & we must consider them as acting either way, as operating on the Nervous or Sanguiferous system. The various powers that excite the Action of the Brain or heart & Arteries directly may be referred to 3 general heads.

I. Into all the various means of exciting sensation; we limit them to all the means of exciting by impulse or what is more strictly called Impression. I have observed that every Impression producing sensation is a Stimulus to the system—the consideration of this is of the utmost Importance in the conduct of health—in several cases these impressions are prescribed as remedies

remedies especially as Prophylactics, but indeed tho' this is an ordinary & considerable means of exciting the system, yet we can seldom use them but in this intention of avoiding the remote causes. We know nothing of the delicate practice of the Methodic sect of employing simple sensations as remedies, nor of keeping a room more or less lucid in order to give a particular degree of Stimulus.

II. head of direct Stimuli, are the employment of the Intellect, these are without reflex sensations that give pleasure & pain, without Volition, & in so far as they are limited in degree in duration; every exercise of the mind without emotion or passion may be considered as a direct stimulus and will excite the system; if in excess they will like other stimulants induce debility; but of these I know little, there may be an Indication for withdrawing them, but they are seldom employed as active.

III. head are the various reflex sensations which are to be considered with regard to every sedative power within certain limits. I hear speak of pleasure & pain as general terms, they concur in the production of certain states of Volition, & consequently are sedatives
or

or Stimulant; such have been accordingly employed & have proved useful remedies, but I cannot establish practical rules for their administration; in many cases we have not the power of exciting them, nor in different persons can we judge of the degree to which they will be excited, from a difference of sensibility & irritability, & the course of life in which they have been more or less exposed to them, & even in those cases where we can excite them we cannot by any measure obtain them in a proper degree; neither can we restrain them if in excess, & the slightest differences in these respects may be attended with very pernicious effects. There are instances of Palsy being cured by Anger, but this same passion in a different degree has brought on the same disease. These are to be particularly considered in the potentio nocentes, & by a Physician skillfull enough to discover the temper & constitution of his patient they may be employed as advantageous remedies.

I must reject several Stimuli arising from a disease of the State of our System; those that are direct come under the head of Exercise, those that are indirect are only to be considered as Sedatives which will be treated of separately hereafter. The Stimulant powers then

then as we have mentioned are

1. The Indirect, which are, Strong Impressions producing Sensation.
2. Reflex sensations which give pleasure & pain.

The Direct Stimulants are

3. The Passions as leading to action.
4. Aliment.
5. Astringents considered as Tonics.
6. Exercise of the body a strengthener & tonic.
7. Cold as invigorating the system.
8. Heat — all which I have discussed.
9. Electricity.

This likewise I touched on before; it is one of the most powerful & extensive Stimulants, & of all others the most remarkable for operating more on the Nervous & less on the Sanguiferous System, hence its use in Palsy, Torpor, Stupor, &c; from its giving such a high degree of excitement, so we might expect from the principles we have laid down that it would produce a proportionable state of Collapse, which is frequently the case, death being often the consequence of its application. In particular cases it is peculiarly hurtful, seldom does it fail too of some effect on the Sanguiferous System, and

and it is when this is considerable that it is more especially pernicious; when therefore Palsy is owing to a congestion of blood in the Brain a very small increase of it's Impetus will be hurtful, & in such cases Electricity may generally prove a fatal, or at least never a safe, remedy. I before considered the question of it's manner of operating whether it destroyed the texture of parts by it's violent concussion, but this we before discussed so that a repetition would be needless.

The 10th head consists of Mechanical Stimuli, which may be reduced to

Pain and Friction.

Here I exclude every action on the body from external impulse. When from sharp bodies pain arises the effects are from reflex sensations, which being before considered are not to be here repeated. What remains then of the subject has been principally considered under exercise, tho' we have not yet considered the impulse of friction.

Friction has been considered as a species of Exercise, but Exercise may be confined to exercise depending upon Muscular action or where the body is moved by external force, but friction is only a mechanical means of exciting the action of vessels merely confined to the surface

surface of the body & to vessels terminating there; this will be communicated to the neighbouring vessels, & hence promote perspiration & the determination to the surface; it will perhaps have best effects when joined with warm bathing, as is practised among the Asiatics & inhabitants of warm climates. I have seldom observed any remarkable effects from this species of Exercise, but this I impute to our too moderate use of it, convinced however that if executed with larger continuance & more frequent repetition considerable advantages may be derived from it.

The 11.th & last head of the proper Stimulants are
Chemical Acrids.

A great diversity of matter is here employed, we obtain them both from the Animal & Vegetable kingdoms, their variety is so extensive that we can with difficulty discover whether they are of a common nature or not. we are quite uncertain with respect to their operation, in what manner do they affect the Nerves & Nervous fluid? These are questions not easily to be solved. we know too little of the operations of one body on another as a mist to determine how particular motions are produced; to me the matter rests yet on Experience, ~~nor~~
can

can we a priori say that any of these remedies are fitted to stimulate the body. Physicians observing the effects of sharp Mechanical Stimuli giving a peculiar sensation, have from a similar effect of Acids transferred the analogy to the Chemical; but we have no good reason to imagine that the Chemical Medicines are actually sharp, nor can our most accurate examinations into the Minute parts of bodies lead us to discover this, the most pointed Salts shooting into angular crystals seem to be a confirmation of this opinion, but the larger masses of Salts are by no means a proof of the figures of their Ultimate Elements, and water we know shoots into Crystals that are regular Polygons, but no one from this would conclude that the ultimate elementary particles of water are of an Angular form, on the contrary it is the general opinion that they are perfectly Spherical, which is most ingeniously accounted for by Dr Hooke. This doctrine has been applied to Elective Attractions in Chemistry, but it is in every respect inadequate to the explanation of it, being frequently incompatible with the Phenomena. These doctrines were in their time received with applause but are now rejected by more

more accurate posterity. Nothing can be accomplished with greater facility than the invention of new Theories which may be applicable in some cases, but are deficient in many, to form inductions without the ascertaining a sufficient number of particulars is highly detrimental to Science, & tho' short inductions in cases where we are unable to collect many facts may be allowable, yet in general we should be cautious of indulging it; let us confine the extent of our induction to the facts we have collected, & then we shall advance by slow but sure steps to the boundaries, to the ne plus ultra of human knowledge.

The doctrine then of Chemical Acids acting by a certain Mechanical figure, exactly adapted to the several pores of the body acted on is found to be insufficient, and we shall endeavour to elucidate the subject by pointing out something more probable & agreeable to the Phenomena. When we consider that Vegetables which are sensible are stimulated by bodies of all properties & shapes, we shall suspect the action of elastic fluids on each other from laws not yet ascertained; here the sensitive vegetables are alluded to, which contract with whatever solid matter it is touched. I have
endeavour'd

endeavoured to shew that Stimulus & dissolution happened from a change of state in the *Aether* of bodies. — The operation of Stimulants may be of various kinds of which we have no conception. On vegetables the motion seems to arise from the impulse of *Aether*, perhaps in our body they act by repelling the particles of the *Aether*. The several Stimulants may in some measure be reduced to a few heads, tho' the generalization is not any way perfect. I. As well as we can determine, every kind of saline matter evidently soluble particularly the simple saline which are among the *erodentia* are more or less stimulant, we can conceive that every approach to dissolution may prove a Stimulus, Acids, & Alkalies are more or less corrosive with regard to our solids, affecting their state of mixture & destroying the texture of the parts, above all by acting on the nervous power, perhaps by a direct impulse, or by other means that we cannot ascertain. The Saline matters when not in their corrosive & concentrated states have singular powers as Stimulants. The Neutrals too are manifestly Stimulant, & hardly any of them can be reckoned *erodentia*, it must depend then on another mode of operation. In Neutral Salts there is a mixture of a Stimulant &

& sedative power, & some of them act as refrigerants, & hence it may be doubted whether their action is direct or indirect. Common Salt is evidently Stimulant, & those that appear to be doubtful perhaps require Nerves in particular modifications; thus those that appear sedative in Dr Smith's Expts prove Stimulant, in the mouth, Stomach, & in parts where the sense of the Nerve is preserved entire. Many Saline matters are very Stimulant which are not at all corrosive, hence must act in a way peculiarly different from dissolution.

2. Oils. All the Volatile & odorous Oils termed essential are Stimulant, they are distinguished into fragrant or fetid, hence arises a doubt whether their action is direct or indirect, to these we join the Empyreumatic & Aetherial Oils. These are a fruitful head of Stimulants, & Physicians & Chemists who were fond of attributing the Stimulant powers to saline matters have here adduced an Argument for the Corpuscularian doctrine, they have doubted whether Oil considered by itself is stimulant, & have considered it as a bland fluid, its Stimulant effects arising from a quantity of Saline matter contained in its composition, & so far indeed as the Chemical operations have gone more or less of Saline matter has

has appeared, and those oils in which we perceive the presence of a greater quantity of the saline matter are the most remarkably stimulant. We perceive the presence of the saline matter in oils obtained from resinous plants, in all the balsams & Terebinthina, & these are perhaps among the most stimulant of the oily kind.—

3. Resins. It is not certain that the Acrimony is confined to the essential oil, but to a substance nearly a Resin, where evidently an Acid has been discovered, this more particularly appears in the tribe of Conifera. Bitters have always been reckoned among the Stimulant substances but are, as before said, Stimulants more indirectly than directly. We mention a promiscuous head giving a presumption of their containing oily & saline matter, but neither distinctly evolved nor in their separate state presumed to be oily, because most of these Acrids have a great degree of volatility; of this kind are the Siligues that give a particular natural order of plants in the Tetradynimia.

The Spiritus rector of certain plants, the Garlic Acids &c. are dubious between oil & saline, yet they are both vegetable matters, are acrescent, & are more disposed to putrescency than any others. In this state the matter evolved

evolved consists of a Vol. Alk. therefore in these the Stimulus may be imputed to a saline matter. In many Vegetables we observe a high degree of Acrimony approaching to poison, whether these act on our body directly or indirectly is uncertain. I shall endeavour to illustrate their mode of action.

General Remarks on the Operation of Stimulants &c

As to their operation it is a general remark that Stimulants act more on the part applied than on the Sensorium, are more considerable in their topical than their general effects on the System. They operate on the System only by the Intervention of their topical effects, by the Inflammation they excite in the part which is afterwards communicated, they perhaps act more by the Inflammation they give the Stomach, owing more perhaps to the pain topically excited than to their exciting the Sensorium, than by their diffusion or direct action on the Sensorium. We must however admit their direct action in some measure especially when they are in such condition as to prove Narcotic. On these accounts we are limited in the use of them, at least of most of these Stimuli, as some of them act on the
Nervous

Nervous System alone, they can be applied in cases of Stupor, Torpor, &c, but by their exciting Inflammation they act more on the Sanguiferous System, & this renders their use more limited & applies to the difficulty we meet with in the application of proper Stimuli in paralytic cases where we would wish to have stimulants that act especially on the Sensorium, the former being often hurtful where the latter is indicated. Their effects are more general in the volatile than in the more fixed Stimulants, hence the distinction of our fluids into diffused & topical. With respect to this it may be a question whether any of them act on the Nervous power, by immediately affecting its mobility, or by affecting its mixture; they may do this, without affecting the solid matter in which the Nervous System is lodged, & we must observe some of them in their action are local, others more diffused, and in proportion to their local effects their action will be stronger on the Nervous System. Their effects are different as more transitory or more permanent, and this is connected with their topical & general action. The more transitory then or less topical may be more frequently applied and in greater quantity.

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The more permanent as more local act on the solid substance of the nerves, & excite the sanguiferous system most by the intervention of the Inflammation produced, & hence are to be ^{more} limited in their application. The topical effects of Stimuli have the effect of exciting evacuation, so far as I see there is not a stimulus which applied to any secretory or excretory will not increase its action, hence they universally operate by general Evacuations, & are often emetic & purgative, but are more generally diuretic as this being the most general excretion except perspiration, in consequence of their being applied to these parts, & act by being by some means determined to particular excretions, as these are common to extraneous matters, & as the extraneous matters may have a greater affinity to unite with the matter passing thro' certain excretions more than others. The action of Cantharides as a diuretic may be explained in this way, by its being disposed to unite with the serosity & passing off plentifully by the secretion of Urine. Perspiration tho' the most general excretion yet is so far diffused on the surface that the Stimulants cannot be collected in such quantity as to occasion sweat, hence it is very difficult

difficult to excite sweat except by the application of heat generally to the body by exercise or by Stimulants that excite the whole sanguiferous system, & these latter in their operation would excite the action of the vessels to a degree that would be extremely pernicious.

We distinguished Stimulants into general & topical, tho' far the greatest number of the latter kind. Those that produce Inflammation in the part of application act more by the communication of this than by any direct operation of their own. The division into permanent & transitory is much connected with the former, the more diffused being the transitory, the topical the more permanent. The chief use of Stimulant Medicines are as evacuants, in consequence of their application to secretory or excretory vessels. Sometimes we want to apply them to parts not capable of secretion with a view to obtain their more general effects on the system, as in the cases of Palsy, Torpor, Stupor, & other affections of the Nervous system where the more general diffused Stimulants are indicated, but these have little effect from their weak & transitory nature, & the good effects we obtain depend

depend more on their topical than their general operation. In fever the whole conduct depends on the degree to which the action of the system is excited; sometimes it is torpid & often as we suppose too weak. It is natural to suppose that this should be assisted by direct Stimuli particularly Chemical Acrids, but these are by no means admissible, & our Indications from the Symptoms would be false. Formerly we knew such an opinion was in vogue, that fever was an effort of nature to throw off the Morbific matter & Stimulants as evacnants were given to assist in the throwing it off; but this Theory it is now allowed was attended with pernicious effects. Dr Mead wittily said that the patients who escaped passed as it were *Sia Nugos*. Sydenham & others rejected the use of the Alexipharmac tribe of medicines, & with great propriety, for by their Inflammatory power & permanent effects, particularly exciting exciting the sanguiferous system they contributed to aggravate the disease. We still however employ Stimuli in some cases, but never pure Stimuli with safety, only those that are accompanied with Antispasmodic effects whose action is more ⁱⁿ directly than

than directly. We proceed next to the Indication for diminishing the force of motion.

per Sedantia.

Many cases require the use of these, at least in the proportion of 10 to 1 where their converse Stimulants are used. These are especially important, if we extend the term to whatever diminishes motion, the powers may be reduced to three heads

1. Withdrawing usual Stimuli.
2. Various means of weakening the powers of motion, the mobility of the nervous fluid remaining the same.
3. By diminishing the motions of the system, by changing the condition, & diminishing the mobility of the Nervous fluid.

1st head. By withdrawing usual Stimuli.

Life consists in action, there is a constant motion supported in the Animal system; it appears however that the motions necessary to the system do not depend on powers in itself independant of all others. It has been thought that the Animal Machine was an ΑΥΤΟΜΑΤΟΝ, having powers of motion within itself & possessing a spontaneity in the use of them. I believe our immaterial part in some cases is so, but

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as this is confined with a material machine it does not exert this fully, & therefore if some stimuli were not applied motion & life would cease; by withdrawing external Impressions most part of the functions cease to operate & we fall asleep. In all cases of a preternatural increase of the motions of the system the avoiding Stimuli must be a powerful means of diminishing this motion, & was it not for Stimuli constantly applied a total cessation of vitality would be the consequence, & life would never have appeared except with other circumstances under the application of a certain degree of heat. We have a proof in a Physician who supposing sleep the most healthful state courted this by removing every Stimulus that could prevent it, the tendency daily increased, & Dr Boerhaave says actually ended in Death.

There are many means of withdrawing usual Stimuli, and this head admits of many subdivisions.

1. The withdrawing as much as possible external impressions. Impressions of impulse are to be reckoned under the head of Stimuli, but from reasons already given can seldom be employed as remedies, but as many of these are extremely constant, as light & sound

3. Their absence may contribute to diminish the motions of the system. These not only operate on the organs of sense but affect the intellectual functions, & avoiding Impressions is avoiding the exercise of the mind, which brings us to another head.

2. Withdrawing the exercise of intellectual operations. We observed that the exercise of the mind free from any emotion or passion was no great stimulus, but we find the operations that give a more continued anxious encreased motion, & of consequence prove a considerable stimulus. We should therefore avoid all impressions leading to a train of Thought & prevent the state of attention by constantly presenting such impressions as are not likely to engage us in it; thus an Aeolian harp which varies every moment by exciting sensations that are not pursued & wholly occupy the mind, by preventing the entrance of other impressions attended with a more regular train of perceptions. This to me would have the effect as wholly occupying the mind & leading to nothing correlative, but to a musical ear perhaps it might operate in a contrary way.

3. Avoiding

3. Avoiding all Reflex Sensations.

These deserve to be considered apart from Intellectual operations. Here I comprehend Sensations of pleasure & pain, the several emotions & passions. Some indeed of these are reckoned Sedative, but such from indirect Stimuli cannot subsist without the exercise of the intellectual functions; hence as they tend to keep up the motion they can be employed as powerful Stimuli, & are carefully to be avoided in preternaturally increased motions.

4. Avoiding excess of watching.

This in every System has its bounds, I call its protraction beyond these limits excess; this protraction cannot be had but by the presence of external Stimuli or by intellectual operations, in either of which views watching is stimulant.

5. Avoiding the Stimuli that excite propensities more constantly in the System.

When in a fever a person has a collection of Urine in his bladder, & from want of due tone in the part a suppression of Urine comes on, still the propensity remains, which is a very considerable Stimulus to the System, but if the patient is raised up & exposed to the cool

cool air the Evacuation will be promoted, & considerable Irritation will be taken off. When a quantity of feces are collected in the large Intestines without proving a sufficient Stimulus to the excretorys, if their duration should be considerable they become very violent Stimulants to the system, & in these cases to procure Evacuations is the means of withdrawing Stimuli. To this head I refer the gratification of solicitous appetites in cases where we cannot avoid them. This is difficult when applied to particular appetites; it would be hard to say how far the System would have its motions diminished by the gratification of Lust. If the Stimulus is very considerable perhaps this effect may take place; but if we consider how often Lust may be excited without the state of the System necessarily requiring it, we shall find that the gratification of such a propensity would be a dangerous indulgence in practice. The giving way to Propensities is a means of withdrawing Stimulus, as in the cases we are now instancing, viz, the gratification of Appetites. A man it is said if very hungry has such a constant irritation & desire for food that he is unable to sleep, and hunger
from

from gratification is certainly, often succeeded by diminished motion, but in a case where the Impetus is much increased we must employ the mildest and most innocent food, if we would diminish the motion, & the indulging of this is useful as it is a means of taking off the propensity & consequently a diminution of Stimulus. Thirst is often attended with great desire for gratification, & this is not attended with the Stimulus of food. The natural drinks are rather fitted to diminish than excite the system. But however in particular diseases this gratification of Thirst may be contraindicated, as in the cold fit of Fever when there is great difficulty of breathing & the patient has a great desire for drink, we can here by no means permit an indulgence of it but had much better keep up the stimulus of thirst than drench the patient with ~~that~~^{drink} that would further injure the breathing. We may take off the Impression by Aesculent Vegetables, or rinsing the mouth & fauces, & this frequently has the effect of withdrawing the Stimulus & often inducing Sleep.

C. Withdrawing nourishment.

This by it's bulk & quantity supports Tension & is
an

Sedantia

III.

an external stimulus from its having greater or less Acrimony.

7. Avoiding the Exercise of Muscles.

This is an obvious observation, but considered by the vulgar only as the exercise of muscular motion, but we must take in the accelerating exercises of respiration, speaking, laughing, & which increase the Impetus of the blood thro' the lungs & left Ventricle of the heart, & this is a stimulus carefully to be avoided.

8. Avoiding Heat.

This I said is the most necessary to the preservation & exercise of the powers of life. In this climate 62 is the agreeable point. The degree in which the external heat is in balance with our sensations & generating power; a degree or two above or below I have found very troublesome to a patient. I gave you an extraordinary instance in proof of it; a patient of mine had such a remarkable delicacy that the smallest increase of heat was productive of the most immediate effects; below 62 deg. she was perfectly easy but at 64 a sudden uneasiness of respiration came on with a frequency of Pulse. To this head we may add withdrawing excess of cold which we before observed
acts

acts as a considerable stimulus. In diseases in general we may go below this temperature of 62 dego as most of our disorders are attended with an increase of the generating power. Experiments must be made to shew what cold may safely be applied in fever, in order to preserve the balance of the generating power; this gives the chief part of the Antiphlogistic regimen so much talked of. We may add to these ~~imaginations~~ causes all inequalities of the body, as all unusual & uneasy postures, where the muscles are not in their ordinary balance, & avoiding all inequalities in the temperature of the body; by this we must not avoid the inequalities we are constantly exposed to, as ordinarily we know we do not cover up our face & hands; now to do this in any case would occasion an inequality, & increase the temperature of the system, or the several means of taking off tension.

IInd. head. This consists of the means of weakening the moving powers of the system, or the several means of taking off tension. These are chiefly evacuations of all kinds which have all the effects of relaxation without producing any stimulant effects

effects. The Evacuation by stool is of this kind which is effected in taking off Tension, & by a combination of a Sedative with it's Stimulant power proves no additional Stimulus; but the chief means we make use of to promote this effect is by O.S. which by an evacuation from the small vessels relaxes & considerably diminishes the motions of the System— these we shall consider hereafter.

To this head I refer warm bathing, one part of it's operation I referred to the pleasant sensation arising from the relaxation of the nervous Extremities, & perhaps other agreeable sensations may have nearly the same effects. Another means supposed supposed analogous to the warm bath is the plentiful use of diluents and tepid drinks which are considerable relaxants & make a part of the Antiphlogistic regimen. Their operation is difficult to explain, by relaxing they operate on the Stomach, allay thirst & dilute Acrid contents in the whole Alimentary Canal. They are chiefly watery & give to the vessels a fluid of less tension than the red globules or coagulable

Sedantia

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coagulable lymph, its want of Elasticity is however compensated by its bulk, & tho' it may be supposed to fill & thus keep up the Tension of the system, yet it is with a more fluxile fluid that readily passes off by the excretories; by the quantity of fluid that should pass off by the excretories being diminished a collection naturally ensues, and the fluids by their adhesion are confined to the red vessels, hence a plethoric state & great tension is the consequence; now the operation of diluents is chiefly, by supplying a thin fluid that readily passes off by the various excretories, & by taking off the tension of the vessels these are readily kept open, & the proper fluid from the blood may pass thro' them. To this head I might refer the application of sedative Impressions, direct & reflex sensations, but these like the Stimulants are very difficultly commanded, and tho' we are able to excite them, yet we cannot with any exactness determine them in a proper degree, & therefore they come not under the cognizance of our Art.

III head

Refrigerants

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III.^d head. contains the more strictly sedatives which are powers operating directly on the nervous fluid by diminishing it's mobility.

These I shall attempt to reduce to certain heads. They are of various kinds & natures, how far they agree in a common nature or a common manner of operating is yet undetermined; We are so little acquainted with the nature of the nervous fluid & equally so with the operation of one body on another as a mist that it is impossible from their effects or qualities as yet to refer them to a common head. We shall divide them into three classes that appear to be distinct from each other. Into

1. Refrigerants.
2. Astringents
3. Soporifics.

Refrigerants.

The only substances of this class are the Acids & Neutral salts, & in these there is a difference of action since some appear to be universally Stimulant. Physicians have found acids & neutrals

Refrigerants

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to be good in various cases of increased Impetus, but by what power these effects are produced, whether by a refrigerant, sedative, or any other is altogether uncertain.

I think it is from their refrigerant or sedative power, for no other supposition that has been made accounts for the effects; thus in Acids the sedative may be referred to Astringency, but this does not apply to Neutrals. In both it has been supposed that they may be thought sedative by a general Antiseptic power, but particularly by their Antiseptic power which opposes putrefaction, & therefore the generation of a considerable Stimulus is to the system.

They may be supposed to operate this way in the Stomach which is often disordered by a certain Fermentative state of the contents, but considering the small quantity in which they can be born & the large bulk of the contents, even in the Stomach they will be found to have but inconsiderable effects, from the greater bulk & diffusion in the Vessels they cannot be supposed to alter the state of fermentation in them. An Ounce of Nitre taken in the space of 24 hours is considered as a very large dose, & no one can bear a larger quantity without vomiting or purging

purging. If we consider this quantity given by a dram at a time we shall see that after the extensive diffusion it must have undergone in the stomach, lacteals & blood vessels that no quantity can be present in any particular part, sufficient to prove Antiseptic; & double the quantity might be taken without any discovery of an Antiseptic power.

The operation has again been referred to the attenuating power of Neutrals, that by thinning the blood they promote the passage thro' the excretories. Some Experts indeed seem to favour this attenuant power of Neutrals, but that in the body they can be applied in sufficient quantity, is by no means admissible. To Acids, being coagulants of the blood, this likewise is by no means applicable, & in both the operation seems to depend on their common nature. A 3^d opinion is that they act by opening the secretions & thus favour the diminution of increased Impetus. Their promoting the exclusion of Faeces may indeed concur in the effects, but this is not the whole of their operation, for independant of this we have some direct proofs of a sedative power. Sedatives have their operation in the stomach only imitated by the application of cold. Neutral Salts &
Cold

Cold water thrown into the stomach diminish the frequency of the pulse, & by occasioning a reaction of the system determine the heat to the surface & produce a considerable flow of sweat. Now the question is whether neutrals operate by actual cold or otherwise. I do not mean here that they act by actually cooling, but by a sedative power analogous to cold water. Many have embraced the opinion of actual cold, & it has been supposed from Nitre & other salts, generating cold in solution that this was actually done in the stomach. Nitre in solution has this effect, but it is only during the solution, for when that process is over there is no generation of cold. A gentleman has lately said that the effects were greater from a recent solution than one that had been some time made; but this depends on the solution not being made perfect, for certainly Nitre taken in substance while dissolving may generate cold, which may have some effect proceeding from a direct refrigerant power.

Another proof of their sedative power is that taken as purgatives they leave the intestines under some degree of Atonia, & this is favourable to the existence of

Refrigerants

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of Air in that cavity, hence flatulence & spasm so frequently subsequent on the Administration of Neutral Medicines. This follows in greater proportion from these than other purgatives, tho' the evacuation is often more copious in the latter. Altho' they stimulate the Secretories, yet they are never capable scarcely of exciting Inflammation or communicating their effects to distant parts. Their Stimulus too is very transitory & hence may be deduced a further proof, that it is soon observed by a stronger sedative action. To this sedative operation of Neutrals there is one exception, viz, common Salt which produces a Stimulus & is apt to excite Inflammation. Mr Alexander of this City found that Nitre taken into the Stomach diminished the pulse, but the frequency was regained in a few minutes, the first part proves the sedative effect, but its being so transitory makes its effects in Fever to be suspected as inconsiderable. Cold water he observes acts in the same way, it diminishes the pulse & then increases it beyond its former frequency. From Dr Smith's Expts it appears that Neutrals applied to the Nerves of Animals took off their Sensibility, and this seems to be a direct proof of their sedative effects. Acids as Antiseptics seem to have a power of fixing Elastic fluids

fluids, at least prevent their being rendered Elastic, but this is too subtle a Theory for us to enter on at present.

Astringents

These by astringing the simple fibres must take off their mobility & that of the Nervous fibre connected with them, by condensing the moving fibre it takes of the Mobility of the Nervous fluid, whether this is in consequence of its operation on the simple solids of the body or on the Nervous power itself is not necessary to determine, since Astringents can produce an Restriction in the moving fibre, & by giving them a firmer tone may diminish the increased motions of the System, especially those depending on the mobility & Atony of the System. The Bark from the ~~Combination~~^{Combination} of its bitter & astringent qualities cures intermittents & other spasmodic disorders, by taking off mobility on which the recurrence of increased motions depends. On these accounts I conceived the operation of Astringents to proceed from their sedative powers; dead however seems to shew a sedative power independent of Astringency or perhaps any other quality we have mentioned, it proves a sedative applied in different forms bringing on Paralysis. Its common form is its being converted into a saline substance, in the Saccharum

Saccharum Saturni & other chemical preparations of it, & this is productive of a sedative effect; but dead exhibited in another form unaccompanied with saline matter produces the same effect more powerfully, converted into Vapour the most dreadful Paralytic effects are produced, & here there can be no suspicion of Astringency. Mercury in no state either with or without the addition of Saline matter is the least Astringent, yet produces Palsy. Metallics of some kinds then seem endued with a sedative power, tho' on what it depends we know not, yet whatever it is it can hardly be referred to Astringency. We must therefore mark it as a peculiar Metallic Sedative under a different head. In the various cases of Metallic Substances being poisonous, operating by a stimulant power in the Stomach & exciting violent Inflammⁿ in that organ, as in the case of Arsenic which with all other Metals tho' they act as Stimuli yet exert great sedative powers. —

Soporifics.

These are a very numerous head of Sedatives, but I shall not enter into the Materia Medica, nor consider how many may be referred to this class. I shall consider them in general by taking a particular example of

of one of the most powerful, viz, Opium.

Opium is now known to diminish Sensibility and Irritability, it has a power of changing the Muscular fibres & acts on every part of the System by occasioning such a diminution of its mobility as to produce Sleep. We conclude then that it diminishes the Mobility of the Nervous power & takes off the excited state of the Sensorium & Nervous System that is so necessary to life & in which Animal Vitality consists. What this operation is I shall not pretend to determine, but I assert that it is by its actions on the Nervous fluid in opposition to the other Theories of its operation on the blood. Some have referred its action to Coagulation & others to the rarefaction of the blood; in the first way, by increasing the density & consistence & rendering it unfit to pass thro' the minute extremities of vessels & hence the secretion of the Nervous fluid suppressed; in the 2^d its effects on Sense & Motion is deduced from the rarified fluids distending vessels & compressing the Fibres. There is indeed a Turgescence of the vessels & perhaps some rarefaction of the blood, but if so it happens from the laxity of the vessels induced by opium. This especially appears the day after its administration,

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as it does in drunkenness where the Tension of the System is weakened. But the objections against this are, first, from the small quantity applied, which is too inconsiderable to produce a change in the mixture of our fluids.

All substances that produce violent operations by the application of a very small quantity, may be divided into two kinds, 1st those that operate by the powers of fermentation, or 2^d those that operate on the nervous system, & except in the former way we know of no small particle of matter acting on a large mass. Van Swieten says that a small quantity of Opium taken into the body produced death, & upon dissection was found in the Stomach; the Opium here must have diffused itself over the whole System by its action on that single organ, & the smallness of the quantity takes off all supposition of a fermentative process, it could not be capable of increasing its quantity in the body.

The suddenness of its operation is a strong Argument against its acting on the sanguiferous System, for if it acts on the blood it must be topically applied to it all over, but it acts instantaneously before any Absorption could take place to carry it into the blood

Opium

12A.

blood. Opium operates by destroying sensibility & especially irritability, when the part is removed from all communication with the sanguiferous system & even the Brain itself. Dr Haller's objections are by no means valid against Dr Whitt who asserted & proved by certain Expts that it operates on the Nerves without any connection with the sensorium. If these Expts are disputed yet the topical effects of Opium so often observed can admit of no fallacy; a quantity of Opium applied to a pained part relieves it more than 4 times the quantity applied to a distant part, and therefore we reject the opinion of its acting on the blood, & assume the only probable one of its acting on the Nerves & fluid of the Nerves. By diminishing sensibility & producing Sleep it appears very fit for allaying pain, & by diminishing irritability it is fitted for diminishing increased action & by this means restraining evacuations depending on it. Opium, tho' its operation on the System is Sedative, yet in many cases it proves a Stimulant by exciting the action of the Brain & sanguiferous System. From this mixed operation of Stimulant & Sedative we

we account for its power in producing delirium, & this is easily reconcilable to the other parts of our system. I have endeavoured to show that delirium depends on the unequal excitement of the sensorium, hence illustrated by Opium in which the two different powers are combined, the sedative being predominant. The convulsions & spasm so frequently subsequent on the operation of Opium may be explained by the excitement succeeding collapse. This action might be referred to the operation of two different matters in the same substance; but such a combination being so peculiar, & different from what we observe in nature, seems in a manner inexplicable, When we can easily conceive a Stimulant & Sedative power combined in the composition of the same substance, but this is by no means evident to the Chemist's attention, for a mixt in Chemistry has but one quality, & from the simplicity in the composition of some Sedatives we cannot admit this; like Acids indeed when applied in their concentrated state is as to alter the texture of the Nervous solid are highly stimulant, tho' their operation on the Aethereal fluid of the

the Nerves may be sedative. This will apply to the effects of Opium as to its topical Inflammation & general sedative power. It may with greater probability be referred to the general action of Sedatives, which given in a small dose produce a moderate action only, i.e. a sedative effect, & like all other causes of Collapse occasion a reaction of the Sensorium & thus becomes a stimulus indirectly. Another effect of Opium sufficiently established is that it leaves the System in a state of Atonia and greater irritability than before its application. We may suppose that this is owing to its being materially taken away in part when at a certain state, then sedative being less than the Stimulant, the body is liable to convulsive motions, that is, that the sedative effects pass off before the reaction of the Sensorium, its Sensibility being sooner over than its irritability, & its effects in diminishing Tension remain, hence a source of Atonia & Mobility. I can easily conceive Sensibility to be a passive quality in the brain, which is pretty considerable when the System is in a state of moderate Excitement, & when diminished is easily renewed; but a much greater degree is requisite to renew the tonic power of the Muscular fibres, hence the

the latter is not so easily recovered, & hence the laxity & mobility that remain. The good effects of Opium then are 1. st From this suspending the influence of the Nervous Power they are useful in all cases of increased influx as in all spasmodic and convulsive affections; it is thus that they are serviceable in increased evacuations which is an *Impetus auctus* but perhaps may be called a convulsive affection. Further the exercise of Sense depends also on an influx from the origin of the Nerves; whether it is especially increased in attention we shall not say. Our Sedatives then by diminishing this influx destroy Sensibility, hence then they weaken the power of Irritation which is assisting to their other operations; they are also universally Anodyne. It was said before that probably we might refer Pain to three heads; Spasm, Distension, & Acrimony. Now distinguishing the influx into the organs of Motion will obviate the two first, & into the organs of Sense will make us less sensible of the last, is very obvious. We may from this see in how many & various degrees this power may be applied, but in practice it is attended with some difficulties, chiefly arising from its
mixt

mixed operation consisting of parts of opposite tendencies & it is not easy to determine in any case of application how far the one or the other may prevail. On these considerations its use has been greatly disputed among Physicians & D.^r Tralles has given us an abridgment of these in two Quarto Volumes but he neither reconciles opinions nor applies facts with great judgment. I shall endeavour to lay down some principles that will shorten the study. This Opium is fatal in large doses, yet by exhibiting it in small quantities it may be taken securely. If we begin with a very small quantity at first, then increase it, & at every increase attentively observe its gradual operation, we shall then discover any effects $\frac{+}{-}$ it may arise, and thus prevent our proceeding to any dangerous excess. Perhaps there are many cases of Spasmodic Affections, watchings &c, that are not to be overcome but by quantities of Opium that would be pernicious & destructive to Life. This however is different in different Persons and is relative to the particular Sensibility of the Patient at the time of its administration. Pain we all know diminishes Sensibility, and to a Person with the Gout in his Stomach a quart of brandy would have less intoxicating effects than half a pint to a Person in health. There may be cases analogous to this when the cause of pain is so great as not to be overcome without the application of such

such a quantity as would be dangerous to life. In the Hydrophobia, or rabies canina Opium might be given but then the quantity required would destroy health, & we are not to accumulate larger doses of Opium but where we can perceive its gradual operation & observe its effects as you proceed in the dose. If there is no gradual operation I should think it dangerous to proceed to large doses; its salutary effects too are often followed by hurtful tendencies; the effects of Atony & Irritability produced by Opium are well known, & a repetition of these gradually disorders & destroys the various functions of the System.

I shall consider then the use of Opium where the Indication prescribes it

1. As a Sedative.
2. As a Stimulant.

Sedative.

Opium seems to be indicated wherever there is an excess of Excitement in the System, either in the whole or particular parts. We must consider this as relative to Sensation or action, but in pursuing our Sedative Indications we must consider the causes of this excited action which we shall find owing to some impression or Stimulus

Stimulus applied to the system, and the Indication in such cases is to remove the cause or Impression from the body by destroying it's sensibility & irritability; this gives us a distinction between Opium employed as a sedative in a curatory or palliating indication. Sometimes the indicatio curatoria is to be preferred, sometimes the palliativa, it is sometimes necessary to obviate the effects of an irritating Stimulus, for instance in the case of the descent of a biliary or renal calculus where the necessary dilatation for the passage of the Stone will require a considerable time, in the mean time it is necessary to allay the violence of the irritation, which may be productive of a fever, but the use of Opium is likewise indicated in diseases where the Impression or Stimulus has been removed, but still the effects remain. If a man has taken an over dose of a purgative, or if nature has suddenly thrown a great quantity of Bile on the alimentary Canal which produces a copious discharge of feculent matter, now here we find Spasmodic affections frequently come on the removal of the Stimulus, and we then can administer no better remedy than Opium. In the consideration of this as a Sedative medicine we must always have regard to the

Stimulus

Stimulus & the mixt operation of Opium. If we employ it in cases where the Stimulus has been of long continuance its operation may consist more in increasing than diminishing sensibility & irritability. I would then forbid the use of sedatives in cases where the Stimulus is of a permanent nature, especially where it excites the Sanguiferous System with a particular determination of blood to the brain. I formerly explained Opium as one of the most powerfull exciters of the Sensorium, & as its operation is attended with such a powerful cause of excitement it will frequently be ineffectual, for given when the Sanguiferous System is preternaturally excited it must increase the power of Stimulus so as to obviate its own effects. Hence we acquire a general rule in practice that Opium is incompatible with fever, where the determination to the brain is especially more evident, and where Inflammatory Diathesis & Topical Inflammation prevail in the System they are still less admissable. It is therefore improper in Hemorrhagy arising from the increased action of the whole Sanguiferous System. These rules are pretty general but how far they are universal in practice we shall presently consider.

We know that Opium by diminishing sensibility alleviates pain & often takes off increased action in the same dose in which it increases Hemorrhagy, wherever then in hemorrhagy & Inflammation we can get the prevalence of its sedative effects it might be proper; but its effects are transitory & it leaves the system under a greater degree of Atonia & Irritability, if then the Stimulating cause of fever, hemorrhagy &c is permanent & remains still in the system then it operates on the Irritability of the system & the disease returns with greater violence. But it has been observed that Opium leaves a turgescence of the vessels, which will aggravate the state of Fever, Inflammation, or Hemorrhagy in the latter cases, from their being connected with Fever or general excitement; but this is more or less in different constitutions as they act with a more particular determination to the brain in some than in others, but wherever Inflammation & hemorrhagy depend on causes acting topically Opium may be useful, as in the case of Calculi which on passing the passages often give the highest symptoms of Inflammation, a frequent pulse & a blood copiously separating an Inflammatory crust, where Opium is admissible. Many have asserted that Opium & V.S. are never

indicated together, but here is an exception, for in purely topical Inflammations U.S. may be useful in taking off the Stimulus from the system in general, while Opium is locally applied, or, in other words, U.S. prevents the general affection while Opium takes off the Sensibility of the part. Opium is very admissible in Suppurations, and its manner of operating appears to me to be in the following manner. Previous to suppuration there must be some Stimulus exciting topical determination, now altho' the Stimulus should take place yet by the serous effusions discharged by the vessels into the Cavities of the part, their extremities are opened & the larger vessels of the part meeting with no resistance will often prevent the Stimulant effects. Now Opium by the combination of its Stimulant & Sedative powers acts with both advantageously, for by the former it increases the general action of the heart & arteries, & of consequence a greater determination to the part, while by the latter it relaxes the extremities of the vessels & renders their orifices more patulent, for the effusion of the fluids to be changed by Stagnation.

Our doubts with regard to the Rehibition of Opium are so directed to the sanguiferous system that its use

is allowed in every case where this does not occur; but there are several exceptions. These cases may be reduced to

1. Increased Sensation.

2. Increased Action.

To diminish Sensibility by Opium & thus remove pain, is where the exciting cause is permanent, only a temporary & inconsiderable relief, and if it is in effect capable of ultimately stimulating or increasing the cause this temporary alleviation is too dearly purchased. Where the cause is of such a nature as the Economy itself has a tendency to remove, then Opium in the case of pain is admissible, the pain is often too the effect of a cause which has passed away, as Spasmodic affections from accidental causes, to which Opium is a cure. It not only diminishes Sensibility by allaying the pain, but removes the cause of the disease, as in the case of Calculi where the resistance of the Membrane to the Stone is not from the rigidity of the simple solids but from the Spasmodic state of the Muscular fibres, where Opium is indicated & gives relief while the efforts of the System for the passage of the Stone still go on. Another case where Opium relieves by taking off the sense of irritation while the operation

operation proceeds to the cause gradually removing, is where pain is owing to an Acrimony, exhausted in its source, and what remains gradually washed out of the body as in the case of Strangury from Cantharides where the quantity taken in is more & more diluted till it is entirely washed off, the pain & irritation in the mean time relieved by Opium. If the cause is more permanent it must not only be void of Inflammation, but it must be case not liable to be aggravated by the rarefaction of fluids which is produced by Opium; if a topical hemorrhagy is owing to permanent topical causes Opium may by rarefaction increase it, & therefore its use is more limited in hemorrhagy than elsewhere.

Where the cause is extremely permanent & perhaps incurable, as in a Cancer, where the pain is to be imputed to an acrimony applied to the part & generally free from any degree of Inflammation, we must relieve the patient from misery by Opium; but in some constitutions it may occasion Inflammatory Symp^{ts}, while in others its sedative powers are so prevalent above its Stimulant that the latter hardly appear; however

however considering Cancer as an incurable disease we may have recourse to Opium; but I have seen it have pernicious effects when Turgescence took place about the part, it's aggravation & increase of the Inflammation by a rarefaction of the fluids greatly more than balanced it's temporary alleviation, we mentioned it's intoxicating powers on the Sensorium & these are too often considerable to be hazarded for the temporary relief of Opium. Dr. Young observes that in several Cancers the symptoms induced by Opium were worse than what would have happened from the disorder.

I next consider the cases of increased action, which may be divided into three different kinds—

1. Where the functions proper to the Sensorium are affected.
2. Where the affection is of the moving fibre alone.
3. Where the affections of the moving fibres are principally concerned in secretion

1.st Case of affections of the Sensorium as occur in Mania, Phrenitis, fever with delirium, the two last however are entirely excluded. In Mania it's use has been much disputed, some treat it as a salutary, others as a hurtful remedy; whenever there is a plethora in the system with a fullness & quickness of pulse

and the disorder approaches to ferocity, & particularly where the determination ~~is~~ to the brain is any way apparent the use of Opium must absolutely be excluded, as tending to increase the disorder by its Stimulus; but where the pulse is not full, & there is no appearance of ferocity or where these symptoms have been removed by evacuation & low diet then Opium is likely to be extremely useful & its use here has been often confirmed. We must in such cases to obtain its full sedative powers give a sufficient dose. Maniacs labouring under a total insensibility require an unusual dose. Physicians in general are too timid in the exhibition of large doses, but the advocates for Opium direct us to push it till it operates. Persons in health are not capable of taking more than gr^{ss} 1 who by repetition have been able to take gr^{ss} 15 with good effects. I must still however add as before observed that we should be extremely cautious in the exhibition of large doses of opium, & before we attempt it should be well acquainted with the constitution of the person we are to administer it to.

Our 2^d head of the increased action of moving fibres includes Convulsion & Spasm, wherever these increased

Opium

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increased motions are durable enough to give time for the action of Opium, this may be employed for taking them off. In an Epilepsy of a few minutes it is to no purpose to apply Opium, but if it lasts a great while there is time & occasion for Opium to operate. Besides this transitory affection I know no other exception of Convulsive motions to the use of Opium but when fever or palsy accompany them. Where the excitement of the system is preternaturally diminished & in cases of Paralytic affections attended with pain they may relieve present symptoms, but aggravate the fundamental effects. It is not only useful in taking off present motions, but is especially so in preventing their recurrence, this is its effect in Spasm, where Atonia takes place the fact is certain, but the particular explanation is difficult. In this place I have reserved the mention of another operation, which is that Opium takes off excited actions from Mobility, and in this latter case it acts as a Tonic & like the Operation of cold gives a greater degree of firmness, & thence obviating the effects of Atonia. This operation is among its first operations & is perhaps where the Stimulus is more than the Sedative power, whether this is owing to the condensation of the Nervous power
of

or arises from a mixture of its sedative & stimulant qualities. I shall not determine but it is to be separated from an effect in the latter part of its operation, viz, to give Atonia. When we would prevent Atonia then we must apply Opium at such a time as that the first effect may take place just as the Atonia returns, & in consequence of this the irregular action. If the Stimulus is so permanent that Opium passes quite away while the Stimulus subsists, Opium then aggravates diseases, hence admissible in few cases of Epilepsy. When I have known the exact time of an Epileptic fit's returning I have prevented the attack by the administration of Opium in a sufficient dose about an hour before. In some cases it has cured, but in others where the cause was of a more permanent nature, it occasioned a recurrence by increasing the Mobility of the System on which the Subsistence of the disease depended.

The 3^d Case of increased action is of the moving fibres concerned in the various excretions. — Opium can take off this increased action; it takes off the Action of the heart & arteries, this impells the blood to the secretory vessels with less force & then the elastic vessels contract & diminish Secretion, but to this there are

are exceptions. Wherever the Evacuation is attended with fever & a general increased action of the system it is by no means admissible, as in the case of hemorrhagy attended with fever, & a general increased action of the system, it is by no means admissible as in the case of hemorrhagy attended with fever & general sweat, instead of alleviating it proves hurtful & increases Evacuation. Again Opium is improper where the matter to be evacuated can be sent off by no other outlet than that which is attempted by the disease; Thus Acid matter in the intestines to be evacuated by vomiting or purging. You may obtain indeed a temporary relief by Opium, but it afterwards has very hurtful effects, thus in Cholera Morbus where Opium is only proper when the matter is already evacuated & a spasmodic affection remains in consequence of it.

In Dysentery its use has been much disputed. I believe in Dysentery there is always more or less of the febris introversa; when this subsists, or there is any Indication for bleeding Opium is not admissible, but when Dysentery arises from Acid matter, the consideration of lessening the Evacuation ought not to hinder our administration of Opium, for the relieving pain & preventing the return of spasm more than balance any imaginary effect

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of evacuating a ferment without it. Probably the Dysentery depends on an increased evacuation of Mucus, & this poured out from the secretories on the surface of the Intestines frequently proves of an Acrid kind & we can here use Opium as well as in a Catarrh, as merely an interruption of the secretion may suspend the flow of Acrid matter from the mucous follicles & in this way it removes the disorder. Opium is different in its effects from Astringents in being more transitory, tho' it retards it does not entirely suppress the peristaltic motion; besides, the Acrimony of the intestines tho' kept in may be made milder by effused fluids, & perhaps depends more on ^{increased} secretion of the mucous glands, by which the Mucus not having time to stagnate & become mild is thrown out into the intestines in a thin acrid form, & the disease seems to depend more on the cause than on any supposition of contagious matter. Opium then may render the irritation less & thereby moderating the secretion of Mucus & occasioning it to be longer retained in the mucous glands will in this way be a corrector of Acrimony.

In Coughs depending on increased secretion of Acrid mucus, from the follicles of the lungs & aspera arteria,
Opium

Opium is good provided there is no fever or Inflammⁿ attending it, & this perhaps is analogous to its action on the intestines. In Dysentery often a Spasmodic contraction prevents the propulsion of the contents, & hence collections in the Intestines. This is taken off by purgatives, & the effect will be in some measure obtained by opium lessening the Spasm - A priori then I should approve of Opium in Dysentery, & this I have found conformable to my own experience.

Stimulant.

These may be employed wherever such a Stimulus is indicated to excite the sanguiferous system & where we expect more from its stimulant than sedative effects. The circumstances of the latter being prevalent makes opium less applicable in Palsys. As a cordial Opium acts only with those who have been much accustomed to it, for then the quantity is such as admits the division of the dose; but in our Island these effects are better obtained by Wine. As a Stimulant it must be given in such moderate quantities as are best calculated to produce stimulant effects, thus Wine at first exhilarates before it gives soporific effects, but this differs in different constitutions, for in some it gives

gives its soporific effects, but this differs in different constitutions, for in some it gives only its soporific unaccompanied with its exhilarant effects. Wine also exhilarates some, while others it renders Inane; in the first case it perhaps acts more on the sanguiferous system, in the latter on the Sensorium. Opium proves an excellent remedy in cases of fevers with too low a degree of excitement; here we would wish for such a sedative as we might best obtain the Stimulant effects from, and such is Wine in preference to Opium; the latter has often good effects, but I have often observed sedative effects during its operation.

In Intermittents Opium seems to operate by giving a certain firmness & tension to the Nervous system & therefore obviates Atonia & the Spasm hence arising in Intermittents, this effect is little attended to but is often very apparent; thus in intermittents, & in the Nervous fibres where it acts as a Cordial it is rather from this than from its purely stimulating effects. This action I apprehend is beneficial by taking off excitement in some degree & like Cold gives greater tension & firmness.

Opium is good in those cases where we would excite the sanguiferous system; perhaps from its sedative effect combined with its Stimulant, it acts by the former

former in relaxing the vessels at their extremities, while by the latter it excites the action of the heart & arteries, hence disposes to sweat; accordingly I have not seen the sudorific effects of Opium except in such a dose as to give it's sedative effects. I mentioned the good effects of Opium in Intermittents may be perhaps supposed to excite Artificial fever, but I rather refer it to it's tonic effect depending on the sedative power combined.

Antispasmodica.

This is the most difficult & obscure Indication of any Inserted in our table.

The Nature of Spasm is not known. What occasions the peculiar permanent state of Contraction instead of the usual alternate states of contraction & relaxation will not ^{be} known till Muscular Organization is better explained. While ignorant of this I am not certain if we can enumerate all the causes or explain the operation of the remedies; I shall however deliver as much as the nature of the subject will admit of.

First then, as in Spasm, by contraction the parts are brought closer together, we should conclude Relaxants to be useful, and this in fact appears in the operation
of

of the warm bath. The effects of this are perhaps principally owing to heat. In the Spasm there appears somewhat that takes away the moving oscillating power of the Nervous fluid, this state perhaps heat excites & restores, hence then we have a set of Antispasmodics that restore the mobility of the Nervous power, & these are heat & the several means of producing it by friction &c. 3^d Case is the overstretching of Muscular fibres, such a state of the fibres renders them liable to Spasm; this we think particularly takes place in the blood vessels; thus Inflammatory pain is generally succeeded by turgescence & congestion in the vessels, hence as a Remedy I set down bloodletting as diminishing the extending cause.

I cannot say how far Inflammation is attended with Spasm; we know however that there is an increased tone which will be removed by the same means; this gives a caution with regard to warm bathing, where the heat will increase the overstretching, hence bathing is often hurtful in Rheumatism. Spasm is often to be excited by Stimulus applied to any part of the Nervous system thereby occasioning an increased influx of the Nervous power, and therefore
Sedatives

Sedatives as taking off increased influx are powerful Antispasmodics.

We have another means of taking off increased influx, viz, by exciting attention in another part, which if sufficiently strong makes a derivation of influx, which like Sedatives suspend the increased energy.

On the same Theory depends the fact of a greater pain obscuring a lesser, if attention of the mind diminishes pain as in many instances it does, in the well known cases of hiccup &c, it even suspends the increased energy of the Sensorium to the Sanguiferous System, thus Toothach is instantaneously taken off by surprise.

As Atonia gives irritability & hence occasions Spasm we may see that Tonics as Astringents, Cold Bathing &c will be indicated, and these act as well by restoring general Tension as by taking off topical Atonia.

Spasm is likewise often owing to a weakness of the Antagonist Muscles; thus I have found the weakness of a Muscle attended with a spasm of its antagonist, & in a cramp of the Gastrocnemii this taken off by exciting tonic motion or increasing Tension with it

it, by pressing the foot against firm bodies. I have often prevented & removed the Cramp by nicely balancing the Antagonist Muscles. A Spasm of the Extremities is often taken off by Spiritous liquors which restore tension to the Stomach. This leads me to observe the effect of Stimulants in Spasm particularly in the Alimentary Canal.

The effects of Stimuli in removing Spasm are illustrated by their effects in removing flatus, which is generally owing to the expulsion of Air which was formerly contained in the intestines by the Spasmodic affection. The Stimulus operates by exciting other parts of the Intestinal Canal & propels the Air against the Constriction, affording as it were an Antagonist power which frequently terminates the Constriction. But these Stimulants are not only fitted to expell present flatus, but they likewise do this when no present appearance of flatus has occurred. If I am several days without flatus appearing yet upon taking peppermint water, eructations of wind happen. This fact I cannot explain but it is an effect of Carminative medicines & one that particularly distinguishes them. Besides

Opium

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Besides the action of moisture, heat, evacuations &c all the Antispasmodics are Stimulant or Sedative. In most of the Antispasmodics used by Physicians their operations are combined, but the Stimulus is of the Inflammatory kind and obscurely nearly the Sedative. The more strict Antispasmodics are the Volatile Oils, as Essential, Empyreumatic, or Aetherial. In enumerating the Essential Oils you will readily take in Camphor, Musk, & Castor. This leads to much application. I know no Antispasmodics that are not of this class or more purely of the Sedative, as Alcohol. The only exception is vol. Alk, it is often a most powerful Antispasmodic, tho' not an oil, whether this is owing to a peculiar action or by it's diffusive stimulus, giving tension to the Nerves, I shall not determine. The Sedative & Stimulant powers in Antispasmodics are generally combined, tho' the proportion of each is difficult to determine. What this Combination does more than the separate powers or how they act on the Nerves is an important tho' unknown Theory.

Morbus

Morbis Fluidorum.

We next proceed to the Indication of the disorders of the fluids, but here whatever Physicians have said of the Pathology of the fluids is involved in the greatest obscurity, & in this respect nearly on an equality with the Nervous system; but under this difficulty it happens luckily that the subject is of less consequence. The state of the fluids universally depend on the state of the solids & their action. There are no considerable changes induced in the fluids but what are owing to affections of the solids. There are few primary diseases of the fluids & of the nature of these few we know but little. In the Ecthymata & Syphilis & perhaps Scrophula there is a peculiar matter changing our fluids, at least it would appear so, tho' by no means certainly ascertained, neither as to the changes themselves nor the substances inducing them.

These considerations will show that the present subject is not of great importance, & the remedies prescribed to alter the condition of the fluids have little efficacy. Most of the good effects proceed from the Evacuation of the fluids, and we shall therefore esteem

esteem our consideration of Evacuants as of much greater importance than of Alteratives.

The Remedies we consider are, first, as affecting aggregation or mixture. In Affections of Aggregation there are two Indications

Spissitude, &
Tenuity.

1. In a vitiated Spissitude we are to cure it per
Attenuantia.

A certain consistence is most conducive to health, & they may on either side be vitiated; but in what manner Spissitude is produced & in what cases, are equally difficult to determine. We may refer a lentor of the fluids to the coagulable Lymph, but we know so little of the production of this fluid that we can determine little as to its operation.

It is difficult then to point out the remedies and especially if those directed are not certainly adapted for the purpose & such perhaps is the case with every remedy employed, water only being an exception. Water introduced will certainly dilute the fluids, but when we can render it durable or even when we can affect a dilution are equally uncertain. We have said that the red globules be coagu-
lable.

lable lymph are confined to the proper sanguiferous system, & hence do not pass off by evacuation thro' the excretories. They have the effect too of entangling & retaining the watery fluids in the vessels & prevent their passing off thro' the pores by exhalation, hence they retain a sufficient quantity to preserve their fluidity; besides this there is always a superfluous quantity of water which furnishes matter as a vehicle for exertion, hence we see that drinks taken in copiously promote the action thro' the excretories & vice versa.

There is a balance between the red vessels & excretories, so that the larger vessels must be dilated before the resistance of the excretories can be overcome, hence an obstruction of the excretories dilates the larger vessels. There is a balance between the extreme vessels & the sensorium, the latter may be excited as well by their contraction as by collapse, hence restoring excretions by diluents is a farther means of diminishing motion. Water has the effect of diffusing the coagulable lymph, and when in any degree divided we can further diffuse it by addition of water, but water alone cannot effect a solution.

solution of the Lymph. The insolubility of the Lymph out of the body, except in such substances that would by their pernicious effects when introduced into the living System still considerably increase the difficulty.

We have however put down in our table Neutral Salts; these diffuse the Lymph minutely if already dissolved, but when once concreted have no effect. Nature has provided the saline serosity to dissolve the Lymph & therefore when Lentor happens the Neutrals might assist this; not however without being induced in greater quantity than the living body can bear in a short time; this effect may perhaps arise from a very long & continued use of them. It is said indeed that we may throw in a quantity of Nitre equal to ℥iij in 20 hours, but this is done by doses not exceeding the quantity of ℥j at a time. A portion of this then will be suddenly passing off by Urine & perspiration & therefore will in no one part of the System be sufficient quantity at one time accumulated sufficient for the purposes of Attenuation. Yet we know that throwing in much common salt (which in the
Neutral

Neutral we make use of in the greatest quantity, whether existing in its proper form, certainly, increases the Saline state. From this state then of Scurvy I allow that a more dilute state of the blood might be obtained by throwing in Neutrals for a continuance, but what quantity is required or how the bad effects are to be obviated is yet a desideratum in the practice of Physic.

Soap has been said to have this effect in a great degree, but I am of opinion it is much less considerable as an attenuant than the Neutral Salts. Dr. Huxham observes that Soap & Alkalies have induced a scorbutic state of the blood, but I would not refer this to the operation of the Alkali in Soap, for when taken into the system it will be formed into a neutral by the Acid in the prime via, & by this means may accumulate saline matter.

Alkaline Salts.

These are powerful dissolvents of Animal substances, but are very much limited in quantity as attenuants. We will suppose this salt to pass into the blood in its proper form, & we shall find that only a
very

Alkaline Salts

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very small quantity shall be introduced; but still left as they are liable to be neutralized, and in this state can act only on the footing of neutrals; but if a saline state of the fluids is necessary for the system alkalies are improper, and no better remedy perhaps can be used than common salt which is disposed to bring on the saline state.

It has been supposed that by their attenuating powers the fluids may pass to the excretories in such quantity as to dissolve calculous concretions. The argument of diffusion is here much taken off as they may be more accumulated in Urine; thus the native saline matters which have no effect in the blood vessels have obvious effects in the urinary passages.

If saline matters act at all on calculi it will be in the urinary passages, because this is a common outlet; much less effect will they have in the biliary passages. I however think that the saline medicines never dissolve calculous concretions except such as are very loose & friable, the marks that we employ to determine this point are very fallacious.

De

Inspissants

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De Haen mentions the symptoms of a calculus vesicae relieved by 1000 ℔ of Lime water & 3100 of Soap, & yet the Catheter discovered the stone to be of its former size.

Inspissants.

There are only two cases of morbid tenuity of the blood which are the aqueous & saline. These are distinguished by the first being owing to an accumulation of a superfluous quantity of parts affecting the consistence of the blood; the 2^d proceeding from a change of mixture in the parts.

As to the Aqueous it hardly deserves attention as very rarely taking place, for an over proportion of water readily passes off as thro' a sieve. The water of the System may be different according to the temperament of the body, but if beyond the usual quantity it runs off by secretion & is by no means to be reckoned a disorder unless the secretions are obstructed. In this case it is not to be cured by Inspissants opening the secretions & giving vent to the fluids, but the states of Tenuity from a change of consistence may proceed from various causes.

1. From large evacuations taking off a great proportion

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proportion of the consistent parts.

2. A deficiency of the Assimilating powers, this takes place in Chlorosis & in several cases of Cachexy; this last is not to be cured by Inspissants but by obviating the debility & Atonia of the System. The first case however may be recovered by much Nutriment, but we know of no remedy that does this immediately as has been supposed.

2. Saline Tenuity. —

Aliment is different according to its kind in its disposition to take on a Saline State, & there are likewise some states & conditions of the Economy that are much more disposed to evolve this than others.

Our Indications then are

1. To correct the disposition of the Economy to evolve saline matter.

2. To employ such Aliment as is least disposed to that state; thus in the Scurvy we give Acescent Vegetables which are less liable to a Saline tenuity, & in so far may be reckoned Inspissants. Whether this will apply to fish, to the Amphibia, to the young meats, are matters of enquiry to make a consistent system

System on the saline state of the blood. The vitiations of mixtures may be various, but we have viewed none but Acrimony, our general view then is to correct & prevent the effects of this.

First then we are to diffuse it with water, or inmiscate & envelop it with certain fluids & which may be reduced to two heads of Mucilage & Oil. The correction of Acrimony brings us then to our Indication ~
per Demulcentia.

This may be done by diffusing with water alone, water being excellent as tending to dilute as well as wash of. We know that the action of many Menstrua depend on a certain degree of concentration, and therefore water as a means of obviating action is here a demulcent. There is greater doubt with regard to the effects of others, for it appears that they are changed by the Assimilating powers in our body & their viscid nature greatly injured, perhaps such as are changed in our fluids are not demulcent. Gum Arabic is said to give Nutriment and of course must be assimilated, & if so it is doubtful whether it is a demulcent. Oil perhaps may give a greater proportion of lymph and hence a greater

greater quantity of an inviscating fluid. A further proof that Oil is a general demulcent is its being always reabsorbed when the fluids tend to Acrimony. Oil then & Mucilaginous Medicines with water, a 3^d head, include the whole of Demulcents.

Water.

Water, as observed before, not only diffuses but washes off. I have no Experience of it, & it would be difficult to believe that Acrimony might be expelled this way. We have however facts of Sanderini attempting to cure the Lues Venerea by a course of water. I have formerly refused a Lentor of the blood from viscid Aliment, but I shall allow that in cases of Acrimony we shall not lose all the effects of viscid by their being assimilated, because the bland & most viscid are perhaps the least liable to be changed in consistence or brought to a saline state.

Oil.

Of this I have nearly the same to say as of Mucilage, I have said Oil is compounded with matter in Assimilation so as to form a new product, perhaps lymph, but still this being introduced may correct Acrimony, for tho' not existing formally, yet it may form a fluid of less tenacity & less disposed to take on the saline state.

The

The Supposition is confirmed from the Oil of the cellular membrane being absorbed in great quantity in a fever where the Saline state of the blood is much increased; perhaps the Oil is deposited chiefly for correcting the too great tendency of the fluids to the saline state.

The supposition is confirmed from the Oil of the cellular membrane being absorbed in great quantity in a fever, where the saline state of the blood is much increased; perhaps the Oil is deposited chiefly for correcting the too great tendency of the fluids to the Saline state. Oil then may be a demulcent but as a remedy little to be depended on. If the disorder is of such duration as to admit its continued use, it may have effects, but whether a sudden exhibition of it has any effects may be doubted. It is difficult to suppose that a few ounces of Oil introduced during the course of a day can have any effect on the Acrid secretion of the Bronchia; it is not certain whether Oil is proper when the tendency to the Saline state is very strong.

I proceed to particular Acrimonies.

Many of these are either introduced or generated in the fluids, but we know little of them. What is the nature

nature of Acrimony in Cancer & in various Ulcerations no one has yet formed a probable conception of.

The Species of Acrimony may be of great variety, but from our ignorance of the Chemical nature of the Animal fluids it is impossible we can enter far into this subject. We consider Acrimony only in general as Acrescent, Alcalescent, & Neutral.

As to the first, or Acrescent Acrimony taking, I discussed pretty fully before, & we consider it only as existing in the *prima via* as we have no proof of its presence in other parts. I endeavoured before to assign several considerations for its existence there, & I pointed out the several remedies adapted to its removal. I need not now throw out any further reflections on the use of Absorbent Medicines of the various Testacea &c, these are to be considered as temporary merely as palliative remedies that only remove the superabundant ingestion of Acid, therefore in this case the Antacida are indicated, but these may be often hurtful, the disease depending on a defect of Assimilation, & absorbents by abstracting the Acid that should enter into the Composition of the fluids may increase the disease; this effect is only limited to the continued use of them, but
is

is however much inferior in importance to the curing the state of the system on which it depends.

As to the Alcalescent Acrimony we are uncertain if it is commonly prevalent from the abundant ingestion of Alkaline matters; from the constant use of Absorbents our fluids may acquire a tendency to the Alcalescent or putrid state, but this case rarely occurs & the Alcalescent state must be derived from other causes of putrefaction. If there is a generation of Alkaline Acrimony it must be in stagnant fluids, & if in vessels it is immediately pernicious & not then an object of practice. To correct this state Acids are evidently indicated which abrogate every Alcalescent state of our fluids. The Alkaline state does not commonly take place in the *prima via*, but may be expected more in the general system & is supposed to be in the Mass of blood; how far Haubius's opinion of a Vol. Alkaline Acrimony being present carries any probability with it I before discussed. I said that the only Alcalescent species of Acrimony consists in a superabundance of Ammoniacal Salt, which is often contained in our Animal fluids in considerable quantities.

The 3^d head of Acrimony is the Neutral, & with more pro-

propriety considered as such than either Acid or Alkaline; this we cure by promoting excretions proper for evacuating the saline matter, & by substituting an Aliment less ready to be evolved to a saline state, by taking off the superabundancy of Ammoniacal salts & obviating the putrid tendency by Antiseptics. Here I have put down the Antireumics, but this till our knowledge of Chemistry does not allow us to enlarge upon.

The 3^d Article alludes to Acrimony being often the product of fermentation & therefore substances tending to stop the progress of this will tend to relieve the effects of this. This cannot be discussed without entering upon the whole Theory of fermentation, which as yet is by no means far enough advanced. We have indeed lately got some new lights respecting the fermentative tendency of the Animal fluids from Dr Pringle & Mr Macbride; these I would wish you to consult, but tho' their Expts tend considerably to advance the subject, yet they do not amount to any fundamental system on this subject. — I shall therefore go on to our next Indication —

Fluida evacuare.

I think it necessary to premise some general doctrine
on

on this subject, & particularly to say how secretion,
secretion & evacuation may be increased. This may
 be done 3 ways

1. By a greater quantity of fluids determined to the
 secretory organ.
2. The state of the fluid more or less fitted to pass off.
3. The quantity & condition being both given, secretion
 may be increased by exciting the action of the secretory
 & secretory vessels.

1. The quantity of fluids determined to any particular
 organ may proceed

1. From increased impetus of the blood, & that being
 given, from a plethoric state of the system. As to the
 greater Impetus it appears seldom to take place, as
 is observable in fever, the only secretion manifestly
 connected with this is perspiration. In Dogs indeed
 increased Impetus augments the salivary secretion,
 why in an impetus auctus the secretion by the skin
 is principally increased seems to depend on a particular
 determination of the blood to the surface, & of consequence
 to that secretion, & secretion in general seems not to
 depend or be influenced by a general increased force of
 the blood in the system, as by a partial determination to
 the blood in the system, as by a partial determination to

a particular part.

2. General fullness. This will have effect on every secretion of the system, how far it is determined to increase particular ones is not ascertained. It is possibly determined to increase sweat more than any other, & that which is increased must have a particular determination to it's organ. We may increase the secretions of the Mammae by throwing in Aliment, but with regard to others we can do it only by throwing in fluid.

3. The preparation of the fluid for passing off; how far this is in our power has been much disputed among Physicians. Few of the secreted fluids are preexistent in the Mass of blood, but all of them are materially present tho' not formally, & the matter suited to perform particular secretions may be in greater proportion in the blood at one time than another, the constitution of the blood is so diversified, but what are the circumstances or cases where it does happen we cannot pretend to say.

A Saline state is fitted perhaps for supplying a greater quantity of Urine, but what is peculiarly fitted for bile, saliva, &c we know not. Was this in our power I cannot conceive much use we could make of throw-
ing

ing in fluids to be again separated, except in the cases of Milk. There has been little attention in the dispute bestowed here, but it has been a supposition that certain Medicines fitted fluids for passing off at particular excretories & dissolved fluids in general so as to suffer them to pass more readily; thus Mercury has been supposed to dissolve the Crasis of the blood & make it run off by Saliva, but all these are difficultly admitted as will appear from what we said of Attenuants. Upon the whole then the preparation of fluids for secretion is very generally out of our power.

It is the 3^d means that is most in our reach and oftenest practiced, viz, exciting the action of the secretories themselves.

Secretion may be increased 3 ways.

1. By the determination of fluids to a particular Organ, or by certain conditions of the system perhaps that excite the organs particularly.

2. The pressure of muscles exciting the action of the neighbouring Organs of Secretion.

3. The Application of Stimulant Medicines.

Of the first there are many Examples. The secretion of Milk occurring only in time of pregnancy & after birth it

it is not necessary to enquire into the Theory of this; there is at that period a particular change induced in the system; a particular condition of the Uterus either determining the fluids to the Mammas or exciting the secretory vessels. Particular passions are likewise supposed to affect particular secretions, these we have previously specified & are conditions that we can rarely conduct or excite. By stopping any one secretion we know we can give a particular determination to another; by restraining perspiration, on the application of cold, we increase the secretion of Urine; by applying cold to the extremities we can excite a copious determination to the intestines; but these tho' necessary to be studied yet are not often applicable in practice.

2. Pressure of Glands by Muscular parts.

Merely by exercising the Muscles in Manducation we can excite the Salivary secretion; sneezing excites the action of the Mucous glands in the nose & fauces. In other cases it will be doubtful; thus purging whether it acts by exciting the secretory Organ or increasing the Peristaltic motion of the Alimentary canal, in vomiting the latter appears to be the most probable, but we may nearly reduce the whole of our

our practice to the 3^d head of exciting the action of the glands by Stimulant Medicines.

It is not necessary or possible to determine whether the stimulus acts on the secretory Organ or on the Muscular fibre contiguous, or whether it acts on the secretory or excretory vessels. It is a question whether any Stimuli have a specific power on any particular gland. Certain Acrids indeed excite one secretion more than another; it is illustrated by the specific action of light, sounds, odours, &c on the several organs of Sense; here is a specific power, but this depends on the peculiar condition of the nerves in these different Organs, which by their peculiar & different degrees of Sensibility are fitted to be acted on by certain external impressions & by those only; something analogous may be supposed in the constitution of the Nerves of particular glands, but no observation from Anatomy points out any thing like this.

It appears to be a fact that every Acid will move every excretory, & there is no excretory that is not affected by Acrimony at different times, & one species of Acrimony will excite several secretories at the same time. There is little foundation then for the

the doctrine of specific stimuli if the same Medicine excites different secretions at different times, the same Medicine proving often at one time Emetic, at another time Cathartic, or Diuretic &c. If Stimulants are taken into the body & operate on certain organs only we may refer it to their being first applied to certain sensible parts. In advanced age they seldom operate in the Stomach because they are more accumulated in particular secretions, & if they appear to go to certain secretories more than others it is only because these are intended as a receptacle for all extraneous matters, or there is an elective attraction between the Acid & the secretory Organ. We now proceed to the particular Evacuations and first

Mucus. —

The secretion of Mucus is a very general & extensive one in the system, as all Canals conveying Air or Acid matters are defended by a mucous expansion on their surfaces. It is uncertain whether we can operate on the various mucous secretions, those externally to which our medicines are directly applied seem to be the only ones in which we can
excite

excite this Evacuation. By purgatives we excite among other secretions the secretion of Mucus, but we shall confine ourselves to those cases in which the immediate & solely intended effect is to increase the excretion of this only. First then it may be secreted copiously from the nose, Mouth, & fauces; Another increase of it that may be useful is in the membrane of the Bronchia, this is from such different causes & with such different effects from the former as to deserve a particular consideration. The Anti-phlegmatizonta may be reduced to

Erhina

These are indicated when the natural Evacuation is suppressed without Inflammation. 2. When there is a congestion of fluids in the neighbouring parts, for by increasing the Evacuation we universally employ the vessels in contiguous parts, hence Erhina are useful in Rheumatic affections of the fauces & head, hence their use in Toothach. They promote a derivation too from the vessels supplying the Eyes with fluids, & hence used in Ophthalmias & in Amaurosis. On the same footing they will appear useful in Deafness, head ach, & even in Comatose & Paralytic disorders.

Means

Means of exciting it.

The Stimulants applied to the glands are particularly assisted, if attended with relaxing effects, thus Warm Bathing. Mucous Secretions then may be increased by warm fermentations; here the mixt operation of Sweat & Mucus, when applied externally, give more considerable effects; but internally applied the Mucous secretion is of service.

2. Acrid Applications to the Organ — There is no room here to suspect a specific power, we must only chuse Stimuli of the most transitory & least Inflammatory kind. This points out the hazard of applying them in cases of Inflammation. We do apply Acids & Neutrals even in cases of Inflammation, as in Angina, to promote secretion, but these are Stimulants that have little power or are accompanied with Sedative effects; more powerful Acrids are dangerous except where the Inflammation is distant from the secretory Organ, as in the Tooth ach.

In cases of Congestion even sneezing has been attempted, but except in very slight affections this is by no means safe. If the Evacuation occasioned is large it may obviate the Stimulant effects.

Expectorantia

Expectorantia

Expectorantia.

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Whether the secretion of the Lungs may be safely excited by irritation of the fauces & glottis as is said to have been antiently practiced by the Medes. They promoted this secretion by external applications, by taking hold of the tongue & pouring an Acid on it & then gently irritated the glottis & excited cough. In this way it is said they discharged Abscesses in the Lungs, probably however with no success as it is a difficult matter to determine when the matter of an Abscess is so far matured as to be fit to be discharged. We must then attempt it by means better known, by introducing such acids into the fluids that joining with the viscosity of the blood are determined to the mucous glands of the Lungs. Such are the Acids that stimulate the secretions in general for I know of no specific Expectorants. The readiness of these Acids to pass off by other secretions accounts for our often being disappointed of their expectorant effects. In large doses they may vomit, in smaller doses they may pass without affecting the stomach, & stimulate the intestines; if they pass these & are taken into the blood they may be determined to the kidneys & skin & be diuretic or sudorific. The two
first

Expectorantia

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first effects may be obviated by small doses & hence we may explain the management of Squills & others of this class, by their acting only as Expectorants, without proving Emetic or purgative. Tobacco is an instance of this & was at first much talked of & found an useful remedy, it produced vomiting but by taking off part of its volatile acrimony its vomiting effects might be prevented & purging would ensue. By rendering the acrimony less active we avoided purging & determined it more to the kidneys. Squills too are determined to distant parts of the System, by diminishing the activity of its acrimony. These means might be employed,

1. In suppression of the secretion, or the discharge of Mucus. Where this is suppressed in a Catarrh is difficult to say, the secretion when of an acrid matter stimulates the follicles and causes a great flow of mucus, but often when it is poured out in the Bronchia a stagnation takes place, its volatile parts exhale & a viscid phlegm remains behind, & in case of hoarseness where from a defect in the secretion the parts are not properly moistened, hence acrid stimuli highly proper.

2. In Congestion of the Lungs in proper Peripneumony or proper Pleurisy it is especially necessary when the Mucus

Sialogoga

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Mucus is secreted in quantity, but from certain circumstances as from torpor of the Lungs, from a torpor of the Nerves of the Mucous Membrane it is with difficulty evacuated, & the stagnant secretion remaining in the follicles requires an uncommon degree of Viscidity till by administering expectorants we irritate the glands & excite it's evacuation.

Our next Indication is to evacuate Saliva per

Sialogoga.

The secretion of Saliva is to be promoted by external or internal applications of Mercury. I shall confine myself to this celebrated Medicine. As Quicksilver is the only internal remedy the practice has related more to the nature of Mercury than the Method of exhibition. The doctrine of this subject I thought was tolerably well understood among Physicians, but as Dr Barry has lately published a treatise in which he has maintained opinions that have been long ago rejected, the authority intitles the dissertation to a reply. I shall give my opinion of it very shortly.

Since the application of the Mechanical Philosophy to Physic, Mercury has been supposed to operate from it's greater specific gravity, and that it's operation in the blood proceeded from it's weight dividing the particles

Mercury

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particles of that fluid. This is founded on erroneous principles, and ~~the~~ affects a very important rule in Philosophy that the mixture of no body is changed by mere mechanical triture or impulse. Every Phenomenon in chemistry confirms this, & this opinion therefore & many other explanations by the Corpuscularian Philosophy are to be rejected. It may be said it acts by affecting aggregation, but to affect fluids a certain magnitude of parts is requisite, for gold may be broken down so minutely as not to increase the resistance of common water. That Mercury could never have this effect on the blood will appear from this that in the motion of a solid thro' a fluid, from the laws of gravity, a heavy body will descend quicker than a lighter, but the heavy body may be so divided that the fluid shall be heavier for bulk than the solid, i.e. if the surface is proportioned to it's mass. Gold is so divisible that when expanded into a foliæ & it's surface is so proportioned to it's mass it can swim in a fluid; now Mercury cannot be introduced into the minute orifices of the Lacteals, but under circumstances, such minuteness of division that the resistance from the adhesion of the blood would

would be more powerful than the effects of its gravity could compensate; therefore from the consideration of the greater cohesion of the blood & the great minuteness that Mercury must be divided into, it certainly will not appear capable of affecting even aggregation. To operate by its weight it must preserve its due specific gravity, but it appears to be in our blood never in its metallic crude form, but either rendered saline or changed by triture & hence its specific gravity changed.

Further the effect of Salivation is produced by saline preparations of Mercury & by these that are most combined with Acid (as the corrosive sublimate) and consequently of least specific gravity, this effect is most readily obtained. The quantity that can be thrown in is so small as not to have any sensible effect even tho' in a state of running Mercury, but it is in the blood in a saline state or somewhat analogous to it, now the saline preparations of Mercury so far from being attenuants are remarkable coagulants of the Blood.

To conclude our Arguments I say in fact Mercury does not attenuate the blood as has appeared from drawing blood from a patient whose body was filled
with

with Mercury & in a high salivation when the Inflammatory crust often appears. We see then no effect that can be supposed to arise from general tenuity, for if this was the case the fluids would run off from every pore; the blood neither does not shew a larger proportion of serum, nor are any of the secretions remarkably increased by Mercury except the salivary. It is not therefore the effect of Mercury to dissolve the blood in such a manner as to give salivation from its Tenuity. What then is its operation? I am under no necessity of answering this, I only argue against the received opinion thereby supercede much frivolous Theory. A specific stimulus is a specious supposition, but this is not to be admitted from the general reasoning given before on this subject; we may use Mercury as an Errhine, an Emetic, a Cathartic, a Diuretic, & general deobstruent & Diaphoretic. The opinion that Mercury is a general deobstruent & stimulant seems pretty well founded, & in some cases we have proof of its operating more on other glands than the Salivary.

The circumstances then giving the appearance of a specific stimulus may act only by occasioning a greater

greater accumulation & operation of Mercury; this is obvious in vomiting & purging. We must however find some circumstances within the vessels that determine matter more particularly to that gland, viz, the Salivary. Physicians have supposed a reason from the heavy fluids keeping the axis of the blood vessels & therefore chiefly directed into the Carotids; but this is founded on the false notion of its retaining its specific gravity; & supposing it did, the vessels are so fleshy that this alone would entirely destroy that supposition, for it is a false fact in Anatomy that one of the Carotids is more directed to the left ventricle than the other vessels. On this supposition we should see the glands of that side where the Carotid runs, be first affected.

The only thing left is to suppose that Mercury is disposed to associate with certain parts of the blood, particularly those secreted in Saliva. We have the Analogy of saline matters associating with the Urine to support this; some such circumstances take place with regard to Mercury, what these are I cannot pretend to say. There are indeed particular
saline

Saline matters that are disposed to pass copiously with Saliva, thus the Ammoniacal salt of the blood, & hence the first effect of the Scurvy appears in the gums. The increased secretion, fetid breath & swollen Gums which appears in Mercury much the same as in Scurvy considerably favours the supposition. — We know that any preparation of Mercury can be suspended in water, perhaps it may be so in considerably greater quantity if Ammoniacal Salt is added.

Mercury does not give Salivation till we have symptoms of it's topical application to glands, & this is confirmed by a Salivation being readily brought on by external applications of Mercury to the Salivary Organ. There appears then no proof of Mercury acting on the Mass of Blood & preparing it for running off, but rather that it operates by being determined to the Salivary glands in greater quantity, & perhaps there affecting the mixture of Saliva particularly. Mercury never acts on the Salivary glands, unless too it acts on the more considerable evacuations of perspiration & sweat, & this constitutes perhaps the principal part of its operation. Salivation is indicated wherever it is necessary to make a very
entire

entire change of the serosity in which Acrimony is very generally lodged. In what diseases that depend on Acrimony I have been expelled by diluents, we have learned more from experience than Theory. The most remarkable is the *Lues Venerea*, but as Mercury is not effectual in other general Acrimonies it gives room to suppose that it is no sovereign antidote in case of *Lues*; this however we do not know from reasoning or knowledge of the matter. An Argument against it is that the *Lues Venerea* is cured more by the evacuation produced than by the quantity of Mercury taken. We can cure the disease by sublimate with $\frac{1}{2}$ part of what is required in Mercurial Unction. If there is any faith to be reposed in the history of the success of Guaiacum, or in the specific found out in America*, the Practice in both seems to turn on the Evacuation; this is especially to be admitted if the several American specifics talked of are really efficacious. In these cases we cannot suppose a specific quality. Our Supposition of evacuation being the most probable let us next enquire whether any peculiar advantages arise from salivation. I cannot admit that it is the
most

most certain means of curing the *deus venerca*, for practitioners from the inconvenience of salivation have attempted with great success a method without it; & if salivation frequently occurs I would say that Mercury scarcely can be accumulated in such quantity as to produce a sufficient evacuation without affecting the Mouth.

The French practice of determining it to the Intestines introduced by Tissot & ~~Adopted~~ by Dr John Douglas was said to be done with great success, but with me it was attended with more inconvenience and less efficacy than salivation, & as a more general confirmation of this the practice is now in disuse. At Vienna of late they have recommended Mercury to be used as diuretic & diaphoretic, I don't doubt, from my own & the experience of others, but this is effectual, but the preparation & administration of the medicines requires such caution as to render this inconvenient. Practitioners however agree in this that great salivations are by no means effectual. This scheme then is principally to give as much Mercury as will promote the secretion by the skin, but at the same time to touch

touch the mouth, and this is the method used at Montpellier; they have seldom executed it by perspiration alone, nor indeed need we be very anxious about this, as a little salivation is not attended with much inconveniences.

With regard to the preparation to be used there has been much dispute, the very acrid determine more to the skin, but the milder are safer & more manageable, & experience has convinced me of the good effects of the mildest preparations. Our next Indication in order is to evacuate Urine per

Diuretica

Urine is to be increased when the Saline state occurs that is to be thus washed off. Scurvy is a case of this kind & it is difficult to determine why such a state is not productive of an increased secretion of Urine. Diuretics however are extremely serviceable in this disease & that kind of vegetable, (Aliment in preference to others) that principally stimulates the kidneys. The division of vegetable into the Acescent & Alcalescent is erroneous, if we from the name suppose the latter have not much acescent fermentable matter, but in so far as they contain a Volatile Alkaline Acrimony the

the name may be proper.

What other Saline Acrimony may by this way be cured is difficult to say, as we know but little of particular Acrimonys; several acrimony's are corrected by Mineral waters whose operation is supposed to consist in carrying off Acrimony by the Kidnies, thus Serophula in which the cure is often so long that we might almost question the existence of Acrimony in the system.

2. Where there is an overproportion of water in the system, Diuretics are constantly indicated, especially if they are effusions of it into cavities as in Dropsy; here besides the quantity of water collected they are indicated from the scanty secretion of Urine. Sometimes we may suppose a suppression of Urine to be a cause of Dropsy, but more frequently is the suppression owing to the derivation of watery parts to other cavities.

We can imagine Diuretics will have effect in evacuating water from the vessels in circulation, but how it carries off water effused without circulation is not so easily conceived; it may however be resolved into a certain connection between absorption & secretion that any unusual increase of the latter is always attended

attended with a proportional increase of the former. This is confirmed in the effects of Diuretics & Hydrazogues of which an observation of the following case is an instance. —

A patient was tapped & a considerable quantity of water drawn off, tho' much remained after the operation. Soon after he was seized with some symptoms of the Ricc. Colic, which was succeeded by a vomiting by which great quantities of water were evacuated; now the activity of the Absorbents taking up the fluid & carrying it into the System must have been very great, & at that time from some circumstances unusually increased, & from such sudden Absorptions we can only explain the sudden removal of large collections of water, as in the Ascites out of the System.

3^d Case is when the suppression of Urine is suppressed, hence Diuretics have been supposed indicated in the various Nephritic affections. When there is an obstruction in the passages from Calculi, & these are small & friable to endeavour to wash them off by promoting the secretion to the kidneys may be proper; but in an obstruction under opposite circumstances we must be cautious in their exhibition, & it will appear dangerous to urge on the impediment by Diuretics.

As to the various other cases in which they are said to be indicated I omit to treat of, as I think their effects are but precariously ascertained. The means of promoting the determination to the kidneys are various. 1st Liquids evidently promote the secretion of Urine, but a portion of these is continually passing off by other outlets as perspiration, hence Urine is to be increased by diminishing perspiration, & thus by keeping ourselves in a cooler air we promote the secretion of Urine. This may be done by sudden cold, which promotes excretion by constricting the Urinary bladder, & the same applied to the kidneys is attended with the same effect. The kidneys may as well be excited by the Cold of the lower extremities as the Intestines, as appears by the aggravation of Nephritic Complaints from cold applied to the lower extremities.

4. Stimulant Medicines applied.

Saline matters of all kinds are diuretic, & this we may readily suppose as they will associate with the Saline matters of the blood & the waters dissolving them. — The Acids have been reckoned Diuretic but are perhaps among the least powerful, especially the more fixed. The Muriatic is more powerful than the Vitriolic & the Vegetable more than either not only from its volatility, but

Diuretica

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but from the greater proportion of water it contains. —
Alkalies likewise operate as Diuretics; the volatile from
their great Acrimony & being more liable to change
are not so considerable in their effects, but the fixed is
among our most powerful diuretics. The neutrals are
considerable in their effects this way, because they
do not suddenly become changed, or if so are often
turned into other neutrals which produce the effect.
If they are less powerful they compensate by the
quantity to be given which may be more consider-
able than of the simple saline matters. In Oils which
have most evidently saline matter contained in
their composition, are also the most powerful diu-
retics; the Acrimony of the Oil depends on the Saline
matter they will contain, & in some this obtains more
than in others, as with the resinous oils, turpentine,
& the Balsams, most of the Balsams & Resinous bodies
have Turpentine for their basis, & these are most re-
markably diuretic. On account of their general Acrimony
their use on many occasions has been omitted, but they
certainly merit greater attention than has lately been
given them. Pitcairn used them as Diuretics in very
considerable doses & in this intention they are sufficiently
authorized as beneficial by repeated instances in practice.

Acrids

Acrids.

These are the various vegetable Stimulants ^{which} contain the Vol. Alk. & all such operate powerfully, by the kidneys, as the Crofs acid, Garlic acid, & squills; the Acrids likewise obtained from the Umbelliferous plants in all which there appears a large portion of saline matter.

With the exception of fixed Alkalies & Neutral Salts all the diuretic vegetables have an Acrimony of the Volatile kind; they are much more comprehensive than those I have mentioned, but they are miscellaneous acids, & not referable to any class, for there then you must consult the *Materia Medica*. On the *modus operandi* I shall only make two general reflections.

There is no indication in which our remedies often disappoint us than that of Diuretics which proceeds from the uncertainty of their operation, as it is difficult to convey them in sufficient quantity to the kidneys. As they are general Stimulants they are liable to act on parts to which they are previously applied, to be exhausted & suffer assimilation, & their diuretic effects lost before they arrive at the kidneys. Where a medicine is remarkably volatile and its effects on the Stomach depends on this latter circumstance it must be considerably

considerably diminished, as in Squills, & if this is not to be done we must divide the dose. Where the Urine is diminished, as in dropsy & where a small quantity of the serosity arrives at the kidneys then but a small portion of the Medicine can take the same course & a very little of it can be applied. In some of our Medicines however the operation seems to be distinct & universally prove diuretics without exciting any other Evacuation, these effects are found among some of the most Acid Stimulants as Cantharides & Colchicum. It is alledged that diuretics are frequently assisted by being combined with Sedatives as Opium, these are supposed (without rendering the Organ insensible to Stimulus) to produce a relaxation of Fibres. I leave you to judge of the foundation of this doctrine, & shall proceed to the Evacuation of sweat per

Diaphoretica.

These are manifestly indicated in suppressions of Perspiration, but this neither happens so often or subsists so long as has been supposed; it is difficult then to say when the Indications take place. It has been supposed to be suppressed in Catarrh, & accordingly Sudorifics are indicated. The exciting perspiration has been found a means of cure, but with suppressed perspiration we have often

Inflammation

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Inflammatory Diathesis connected, and in this case exciting the Impetus of the blood may have a tendency to aggravate rather than remove the disease. They are confined therefore to the beginning rather than to any advanced state of the disorder, and chiefly those in which nature exerts herself for the relief of the patient by spontaneous sweats which often terminate the disorder. It is indicated where Acrimony prevails in the system, it is a copious excretion, & serves like the Urine as an outlet for the carrying off extraneous Acrimony. This seems to account for the fact that Intestinals of warm climates never have the Scurvy, & the disease is altogether unknown between the Tropics. In these countries where they are obliged to feed on saline & putrid Aliment, the ammoniacal Salt on which that state of the Aliment depends is carried off by perspiration. The Lues Venerea is cured easier in warm climates than in cold, & better in summer than in winter, a full & copious perspiration being favourable to the expulsion of this Acrimony. We attempt the cure by medicines that excite this excretion, and the passage by the Salivary glands however copiously excited does not carry it off unless accompanied by

a copious perspiration. Where Acrimony is determined to the skin it becomes an object of this Indication; by this means cutaneous diseases arise, which for the most part are purely topical, in this case we promote a determination to the surface, and by this Evacuation most effectually remove the peccant matter lodged in the superficial vessels. A 3^d case in which perspiration is indicated is when a superabundance of Serum prevails in the system & must be discharged, as in the case of Dropsy. If the water was confined to the blood vessels the most ready method of evacuating it would be by Sweat which can be more copiously excited than the evacuation by Urine, and accordingly Sudorifics are at all times employed in Dropsical cases. There may be cases however of this kind in which their use is contraindicated, because the cause of Dropsy may be aggravated by exciting the sanguiferous system, and this this may be exceedingly pernicious in obstructions of the viscera, by urging the obstructions too violently. Another objection to their use is that the Serum does not subsist wholly in the Mass of blood, but is thrown out either in cavities or in the cellular texture, & we cannot discharge it without promoting Absorption. If exciting perspiration has any effect
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on the lymphatic vessels is difficult to say, every secretion increased has some influence in promoting absorption, but it is uncertain if the increasing the impetus of the blood does any how promote the action of the vessels that should take up the fluid. Another objection to the too free use of Diaphoretics is deduced from an observation of Sanctorius, that sweating considerably, afterwards has the effect of diminishing perspiration. A. The exciting perspiration and sweat is indicated when the balance of the system is to be restored, when by a constriction of the cutaneous vessels the determination to the surface is prevented & of consequence the blood is thrown more towards the internal parts. This is universally the case in Fever & Dysentery where congestions arise in particular parts, & is the case perhaps in most hemorrhages which are to be considered generally as topical affections. These we remove by restoring the balance and exciting a determination to the surface; but in many cases, particularly of the febrile kind, this is performed on a precarious & uncertain footing, if our Medicines do not produce a relaxation of the extreme vessels at the same time that they excite the

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the action of the larger Arteries. If we fall short of the Indication producing sweat the fever recurs with greater violence, but if the Indication takes place it must be by means determining more steadily to the surface, by such powers as relax at the same time that they excite the action of the System in general.

Where the Action of the System is torpid, as takes place in fever, in Comatose & Paralytic affections &c, exciting the Impetus of the Blood is a powerful stimulus to the Sensorium, & therefore artificial fever is recommended, but this is dangerous if the disorder is accompanied with any topical affection, as congestion in any particular part, but where the affection depends on causes inducing Collapse, our indication is effectual, either in being the means of powerfully exciting the Brain or as a general stimulus to the System, & at the same time produce a relaxation in the extreme vessels we must fill the body with liquids which by exciting the action of the vessels especially determines to the skin. I explained before how much excretion by the surface of the body must depend on the quantity of aqueous fluid present in the System, and if this is not present we have no other means of overcoming the

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the Collapse & Constriction of the vessels; this is the most certain method & attended with the least hazard of increased Impetus, for our Indication is best accomplished when attended with less considerable excitement of the larger Arteries & filling the Arteries with a flexible matter which is carried on by a moderate Impetus is the best method of attaining our intention. The 2^d means of exciting perspiration is by exciting the impetus of blood in the system, this will take in every means of exciting the action of the sanguiferous system, & you will naturally suggest the use of Exercise & internal Stimuli. The latter are very various in their effects, but none are specific Stimulants appearing however to excite the Action of the system in general; our Medicines perhaps being first applied to the heart & arteries excite their action first, but from the small quantity given & the great extent of the Organ of Sweat they cannot be supposed to stimulate the excretories, their operation too is so quick as to refute the notion of their topical Application to the organ.

3^d Means of determining to the surface is by Stimulants applied to the Excretories of Perspiration: a
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most powerful one indeed is heat, especially when united with moisture, hence the good effects of the warm bath. Cold likewise may be used where it is so transitory as to produce a reaction of the sensorium, but we often observe its effects to be purely topical, the merely handling a cold body, as snow, produces a topical affection on the fingers, & if cold is a stimulus to the system it will be particularly so to the extremities of the body, & by a reaction of the system from cold sweat is produced as is particularly seen in coming out of the cold bath. — Friction too here applies. Most of our sudorifics are medicines of the Antispasmodic kind, & these operate partly by a stimulant & partly by a sedative power, and those that are the most simply sedative are most effectual in producing sweat, as opium which produces a reaction of the sensorium on the sanguiferous system. Another head of sudorifics are those medicines that determine more to the surface of the body than they excite the action of the larger vessels. Opium, while it occasions a reaction of the sensorium on the heart & larger arteries, it diminishes the tonic power of muscular fibres; it relaxes vessels & hence gives rise

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rise to rarefaction, & will especially do this in distant parts; hence its operation in relaxing the vessels, on the surface; by thus connecting a Stimulating & relaxing effect we account for the operation of Opium as a sudorific. Cold water taken into the Stomach increases perspiration, how the connection of the Stomach with the surface of the body is established I don't pretend to say, but many Medicines operate in this way; the effects of cold may be produced in the System as well by cold liquors taken into the Stomach as by their application to the surface & large draughts of water internally exhibited operate as powerfully by sweat as if externally applied by cold bathing, hence the use of cold drinks in fever. Every body is acquainted with the power of saline draughts acting on the stomach, & give a glow of heat on the surface & a copious perspiration is produced. I need not produce any further proofs to render it probable that their operation is by a refrigerant power, not by the actual operation of cold but consisting in something analogous to it. Another set of remedies are Emetics, the Theory of which is very difficult to explain. It depends on the consideration of the foundation

foundation of the connection of the Stomach & surface of the body. Emetics can be employed as Sudorifics in taking off the cold fit of Fever, & we suppose they do this in consequence of their Nauseating & Emetic power, but the particular application of this belongs to the consideration of fever. We suppose that in the case of Emetics there is not only a change produced by the determination to the surface, but in consequence of their Antispasmodic powers a relaxation is made on the cutaneous vessels, & if you join to the qualities of an Emetic an Antispasmodic or sedative power we then obtain the most powerful medicine for exciting perspiration; this is the rationale of Dover's Powder, a medicine in which these qualities are united, & which of all others is perhaps most certainly to be depended upon. We are next to consider the Evacuation of Blood as existing in the common Mass, & this is either natural or imitated by Art.

The principal Natural Evacuation occurs in two:—men, the — Menstrual Flux

The Theory of this has been omitted in our Pathology & Physiology. I formerly used to mention it here but at present a Physiological account of it is unnecessary as the general principles of our doctrine have

Menstrual Flux

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have been laid down, the doctrine of Evolution being sufficient to explain every thing relative to the Menstrual flux. When treating of the subject of Nutrition & the formation of the body I observed that all the acquired bulk of the body after birth was by Evolution, the parts are determined to the state of Evolution one after another.

The Genitals in both sexes must be evolved at some period & their vessels must suffer such distension till they come into balance with the system. The extremities of the vessels must resist more than their correspondent trunks, otherwise there would be constant excretion instead of Evolution, this resistance is at length exactly balanced by the continual increase of strength in the vessels more than at their extremities when the growth ceases, & the fluids must pass off by some excretory, hence that by the uterus.

I explained how repeated evacuations gave rise to plethora, the extremities after evacuation acquire more resistance, but become with the vessels so lax as to admit a return of the excretion when the fullness returns. These principles will explain the appearance & return of the Menses, it will infer a partial plethora
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of the Uterine vessels. This partial in some measure infers a general plethora, that is there must be a greater proportion of Ingesta retained than eacreta evacuated. This gives fullness & tension, & the tension from the mobility of the system will be very requisite, the general plethora only goes to this necessary fullness & exquisite tension, for it is not in a morbid degree; from this simple reasoning the general doctrine of the Menstrual flux is explicable.

On the supposition of partial Plethora & the tendency even to morbid general plethora it is difficult to say why the evacuation is not affected by abstracting from other parts; but the Uterus has a relatively larger quantity of blood with regard to the other parts, & therefore the relative proportion will remain tho' abstraction is made use of. The relaxation of the Uterus will be a considerable means of occasioning this relative repletion.

The Menstrual flux is an active hemorrhagy, it is not a mere affection of the hydraulic system, if it was it should continue longer till it has caused considerable evacuation; but the Menstrual flux before coming on gives excitement to the vessels of

of the uterus which is the chief means of forcing open their Orifices; here then we shall consider its dependence on the Nervous System. Whatever is repeated in this soon becomes habitual & therefore will return spontaneously at stated periods. To explain other phenomena we must consider the connection of the uterus with the genitals, the evolution of which is accompanied with a set of new situations, with the tension of the Nervous System by which we shall see the general principles of the doctrine; thus the influence on the Nervous System from the sensations of the genitals are considerable, the motions too of the uterus & ovaria & their connection with the Alimentary Canal. We are to excite this Evacuation whenever the flux is proternaturally stopped, it is never to be excited before the natural period of appearing or after that of ceasing.

Pathologists have distinguished 2 cases. One is, when the body has arrived at a period usual for the flux, but yet from some causes does not come on. This the Stahlians call Emansio Mensium.

2. When after having appeared they are stopped, this is, according to them, Obstructio Mensium. This is important tho' does not relate to our subject, as we mention the causes of obstruction which are only in common with the Imansio. The distinction then must consist in one of three cases.

1. In want of sufficient Impetus, or when the necessary quantity is not determined to the uterus.
2. Where the necessary quantity is supplied but from a torpor of the uterine vessels the resistance at the extremities is too strong for the impelling powers, the action of the vessels being torpid & too weak to open the extremities.

3. Both these circumstances being given, viz, sufficient impetus & due action of the vessels, there may be increased resistance in the extremities of the uterine vessels.

1. Want of Determination to the uterus. This may depend on any cause diminishing the quantity of fluids, which again may arise from aliment deficient in quantity or quality, or from evacuations. These causes sometimes act tho' rarely, because the dilatation of the uterus does not depend so much on the absolute quantity as on the proportion of fluids, with

with respect to other parts, & therefore absolute quantity is not always wanting in Emansio & Obstruction. These causes are to be mentioned for the same want of quantity may not always stop, yet fullness will always favour the Evacuation.

2. is more frequently a cause than any deficiency of the blood in quantity, a due want of impetus in the uterine vessels often occurring. That this is a cause will appear from the case of Chlorosis induced by Emansio Mensium, being attended with great flaccidity. This however is uncertain, whether the flaccidity arises from the state of the system or whether from the tension of the system being diminished by a want of fullness in the uterus we shall not determine, as the torpor & atonia when once brought on acts as a cause & by being taken away we cure the disorder. 3. Increased resistance, which may happen from the uterine vessels being smaller or denser; it may happen from the original Stamina or from constriction & obstruction, the term obstruction being taken in the sense of a difficult transmission of the blood arising from a state of the fluids, by which they are unfit to pass thro' the minima vacula, or
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being in a state of debility. This supposition is by no means well ascertained, & this species of obstruction is liable to all the objections against Spifutide of the fluids formerly supposed to be the common cause of obstructions, & there is no reason for supposing the existence of this in the uterus more than in other parts of the system. The most probable cause of increased resistance is from constriction of the spasmodic kind happening from various circumstances, & influenced by the Passions of the Mind as fear, &c. In a system which I might have mentioned various organic affections are adduced which might prevent the blood from coming out the pores from the extreme vessels, but I shall proceed to the means of restoring the evacuation.

1.st To restore the quantity of blood to the parts in which it is deficient, for giving a general fullness to the system is always a means of favouring this flux. This is done by Aliment & in those cases only where the state of the Assimilatory powers render it admissible, but not in chlorosis where there is a debility of the Organs of Assimilation where we must endeavour to restore—

The 2^d means indicated are all the several powers that increase the vigour of the System, & therefore the same remedies are here used as in the former indication, viz. the quantity & quality of the food in certain circumstances & under the restrictions we have mentioned.

3^d means is Exercise. This is a general Tonic & Invigorant & increases the Impetus of the blood; there is however a seeming difficulty in applying this, as the more immediate effects of exercise are to increase the determination of the blood to the surface, and in this way proves a cure for internal hemorrhages, & is perhaps effectual in restoring the Menses, by restoring vigour to the System in general which is communicated in some part to the uterus. The Exercise however must be of a particular kind, as the various bodily exercises have little effect, gestation too is found of little service, we must therefore make choice of an exercise more likely to increase the action of the part affected, which is best done by all those that exercise the lower extremities as dancing, walking, running, jumping, &c. at same time endeavouring to remove the influence of the mind by engaging them constantly in some kind of bodily exertion.

3^d is

Emansio & Suppressio Mensium. 202.

3.^d is the use of the cold bath considered as a strengthener & tonic; there is a seeming objection to the use of this where the uterine vessels are already under a state of constriction & the application of cold may constrict the vessels more, perhaps than the reaction of the System can compensate, and except we use it for a great length of time it is found to be a very powerful remedy.

4.th means is by the application of heat. We judge of the effects of this from observing how much sooner the Menses are brought on in warm climates to what they are in cold. In winter the Menstrual Evacuation is generally obstructed & returns spontaneously, in Spring, & in case of a stoppage of the flux I generally avoid giving remedies till I can procure this favourable concurring circumstance, viz, warm weather & nothing contributes more to the removal of obstructed Menses than to carry the patient to a warmer climate.

5.th Electricity. We have mentioned the power of this in exciting the action of the Nervous System & invigorating the sanguiferous System; if it can be more particularly directed to the Uterus & neighbouring parts it may be effectual. — and.

6.th Invigorating the System by tonic Medicines. The chief of these are the Chalybeates. Steel is a powerful Tonic, nevertheless I have been frequently disappointed in its effects, & I am satisfied it seldom proves beneficial but when administered in the state of solution in Mineral waters where the operation of the Tonic is assisted by filling the body with fluids, & to these Exercise is added. Bark is another powerful Tonic & is not here given with a view to prevent the recurrence of Spasm but as a general tonic; but as it cannot be given in sufficient quantities the ordinary doses of it are found of little effect. Many of the celebrated Emenagogues are to be referred to their stimulating qualities. These act by a sort of Inflammatory effect & therefore cannot be well employed in obstructed Menes without hazard. The use of Mercury may be considered as a pure Stimulus, it excites every moving fibre it is applied to, & tho' acting by a topical Inflammatory effect yet by its diffusion it may excite the whole Sanguiferous System; but its good effects are not quickly perceived & a long continuance of it is necessary which affords an objection to this in obstructed Menstruation. Emetics

Emotics may be considered as a remedy in this case, but whether they act by a general agitation in increasing the Impetus of the fluids or whether they operate on the stomach & excite the system at the same time they relax the extremities I leave you to examine. So far have we attempted to excite & restore the flux by invigorating the system, but our methods in this view are often ineffectual, because we cannot determine the Impetus of the fluids particularly to the Uterus.

3^d Indication is to determine the course of the blood to the Uterus; by blood letting from the lower extremities, which from the Theory of derivation has been supposed to bring more blood into the descending Aorta, I have ever doubt of it's effects both from the fallacy of the reasoning employed in that doctrine & from my own particular experience. By compressing the Iliac vessels which will determine more into the Epigastrics this is supposed to have considerable effect, but it's utility is confirmed by very few Expts. The use of Purgatives is recommended as determining more fully into the descending Aorta, whether this is the only operation of purgatives is uncertain, but

but against this operation all the objections to derivation hold good. The effects however of their stimulus is not merely confined to the alimentary canal or excretory to which they are applied, but also to neighbouring parts, & is communicated from continuous membranes by which all the viscera are connected, and this the stimulus of a purge may produce a determination to the descending Aorta, & by it's proximity promote the evacuation from the uterus; this will have effect whenever we can proportion the stimulus, for an over degree of excitement may be attended with very bad effects. Friction of the lower extremities which excites a temporary kind of Inflammation which will drive into the Aorta descendens, but this must be applied much longer than is commonly done to produce any effect; it is however liable to all the objections against derivation.

Warm bathing is perhaps the most efficacious means of driving the blood into the descending Aorta, and is likely to be extensive; it is useful here as accompanied with turgescence & rarefaction of the fluids a circumstance very favourable to Hemorrhagy.

4. To excite the uterine vessels themselves; this is to
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be done by Venery. The connection of the Uterus with the Organ of Pleasure & its being perhaps so much concerned itself in the Venereal Orgasm will evidently make this of considerable effect. The vessels of the Uterus are remarkably agitated in coition which probably may cause a considerable determination from the System in general to that Organ. It is an observation pretty well founded, that women of abundant menstruation are the most salacious, which may be accounted for by the great quantity of blood in these sent to the Uterus which may increase the Venereal appetite. It has been a practice to throw Stimulant injections, but these reach no farther than the Vagina, what good effects may have resulted from such applications I am entirely unacquainted with, but the inefficacy of administering or more probably the insignificance of the application has brought this practice into disuse. Physicians have adopted the supposition of certain Medicines that are specific Uterine Stimuli, but this I am by no means willing to admit; they have said that some Meds are adapted to excite hemorrhagy to rarify the blood & stimulate the vessels in a particular manner

Emansio & Suppressio Mensium 207.

as Aloetics that stimulate the vessels ~~in the~~ ^{in the} rectum & hemorrhoidal vessels, but this, may be explained by the common operation of purgatives, by the Mucous secretion being in an acrid state. Aloe is a Medicine that does particularly escape the Assimilatory powers & produces Evacuation principally from the Large Intestines & hence from it's exciting the rectum we account ~~for~~ it's promoting the hemorrhoids. All other specific stimuli I refuse to admit from the general analogy of Stimulants, & the particulars condescended on by the advocates for this opinion amount to no proof of their doctrine. They instance the Gums, Asa fetida, & the solid parts of Vegetables or Animals, but the impotency of these when applied are a convincing proof of their being by no means specific. If they have any virtues it is in consequence of their Antispasmodic qualities; to increase the action of the vessels more particularly we may apply Electricity & warm bathing which stimulate the whole abdominal viscera & operate on the Uterus. These with the Sedatives & Antispasmodics that take off the resistance from the uterus & are especially fitted by their sedative & antispasmodic effects to relax & remove constriction.

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In women we have frequent instances occurring of the menses flowing with pain & difficulty, that labour under violent pains in the back & loins & lower belly which protracts the flux for several days together; in this case I have often employed Opium with success. From a constriction of the vessels false pains arise which are mistaken for labour pains, the vessels being thrown into a spasmodic contraction, & here Opium proves a certain cure by relaxing the vessels & bringing on the flow with very little pain. Other Antispasmodics may probably have the same effects, & so far we understand the foundation of their use. The use of the Semicupium is good from the relaxation brought on determining the blood to the surface & communicated to the whole descending Aorta & Uterus; perhaps too fomentations applied to the pudenda & injections of warm water might be applied to advantage. We next proceed to the Artificial Evacuation of blood per

Phlebotomia.

This is one of the most frequent & important remedies & is considered as the principal remedy in Phlegm. Accordingly much study & attention has been bestowed upon it from the first Era of Physic to the present time.

time. It has been the subject of much dispute among the first Physicians which have ever since subsisted & may be considered as a reproach to Dogmatism. Experience however has at all times been appealed to, and in this as well as other disputes Experience has been as long in determining them as reasoning. These must go hand in hand together & the latter has perhaps cleared up the state of facts as often as Experience. To enter into these disputes would take up too much of our time & indeed is not of that importance to require our consideration. I shall just give you my Sentiments on the subject in as clear & comprehensive a manner as possible.

We must consider bloodletting as an Evacuation & therefore the effect will be in proportion to the quantity of blood in the System. One pound drawn from a body in which there is 50 lb of blood will have less effect than the same quantity drawn from a body containing 25 lb. The quantity of fluids in the System has been estimated very differently, those that would increase the quantity take in the fluid that enters the mixture of the solid matter, and shew how light solid substances
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can be reduced by drying, that $\frac{7}{8}$ of a solid bone can be drawn off by drying, but this is unfair, for we must consider only the circulating fluids as it is ~~in~~ these we attempt to evacuate. To estimate the quantity we must exclude the solid parts & the fluids out of the circulation, viz. these fluids deposited in the cellular texture, oil & halitus, & if we consider how much is deposited in mucous follicles in the secretory or excretory vessels, the effusions into cavities, into the alimentary canal &c, and in this view we shall find that the circulating fluids make but a small part of the weight of the body, & our evacuation is only directed to the fluids of the red vessels, for in these the red globules & coagulable lymph are chiefly confined, & 'tis this only we must consider entirely excluding the contents of the venous & absorbent vessels. From this view it may appear difficult to bring the matter to an estimate, but any calculation that can be made cannot perhaps amount to more than a 6th part of the weight of the body; that the fluids in the sanguiferous system are not more than

30 lb in a person of 150 lb weight, a pound therefore drawn away must give the system considerable depletion. I before observed that the quantity of red globules & coagulable lymph must have great effect in varying the quantity contained in the red vessels not only by their bulk but by entangling the serous parts & preventing them from readily passing off. This appears from Dropsy so frequently attending large evacuations of red globules & coagulable lymph by v. S. or other considerable hemorrhagys, by which the mass is rendered so fluid that the fluids exude from every pore. This then is a considerable operation of bloodletting, viz, depletion of red vessels; it has been however said that this is inconsiderable as being very transitory, for the suppression of secretion & the throwing in of liquids soon supply this; but both these particularly the first cannot be so sudden as to prevent the effects of depletion; but the effects of depletion are weakening the Arterial System, if considerable evacuations were made it would be impossible to avoid the bad effects of depletion; was it not for the diminution of secretion; but this does not entirely compensate for the blood by the red globules & lymph going

going off more fluently, & copiously passes off by the co-
=talent vessels. The throwing in of liquids may indeed
supply the bulk of the fluids, but still falls short of
the effect, for it is often more than the red globules &
lymph can entangle, consequently it readily passes
off, & the mere filling the system with diluents is no
compensation for the abstraction of the more solid parts.
These can only be supplied by a nature of the same
kind, by a nutriment fitted to form them, but in an in-
=creased Impetus of the blood the patient has seldom
any appetite, and eating is a stimulus that we al-
ways endeavour as much as possible to avoid. In
health by giving nutritious Aliment the Abstraction
of the red globules & lymph may shortly be compensat-
=ed, & M. Dodart says a pound of blood will be supplied
in the space of 5 days, but this time would be required
even in the most vigorous person; but when V.S. is in-
=dicated the system is generally disordered & hence the
depletion will not only be considerable but permanent.

As to the effect of V.S. we must consider the system
of red vessels always under a greater degree of dila-
=tation than they would assume, this state of Tension is
necessary to the Tonic power of the Arteries themselves;
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it is the chief cause of their excitement, & hence of their degree of action; this tension too is necessary to that of the whole as being so to the Excitement of the sensu-rium; by every degree then of depletion the system must be relaxed. The tone is weakened & the impetus of the blood diminished.

These simple effects are well established & will be more considerable in an exquisite tension or in an increase of tonic power; the latter is what constitutes Inflammatory Diathesis, & hence appears why blood-letting is the most effectual remedy. You will find many effects of blood letting mentioned in authors & the great diversity of cases in which it may be employed, but it is much more limited in its use than is commonly imagined, and is never to be used but in cases, where the phlogistic diathesis concurs; it is useful in Hemorrhages, because in active hemorrhages, this particular state generally exists. There may be some cases of Congestion in which it may be indicated, as some degree of depletion may be useful, but if these cases of Congestion are not accompanied with Inflammatory Diathesis its use must be omitted. The Diathesis Phlogistica is confined to the increase of
tone

Tone, but when Arteries are under constriction / a very frequent cause of topical congestion / it is then with impropriety termed so, as in some spasmodic & hysterical affections.

The whole then of the effects of blood letting may be referred to Depletion, relaxation, & diminution of tone & Impetus. This is illustrated by an Experiment of Dr Haller's in which he observed by a Microscope that the blood flowing from a wounded small vessel produced a derivation from the contiguous vessels to the open orifice, so considerable as to produce a retrograde motion in the adjoining vessels, and in the vessel itself; thus it produced a retrograde motion in a concomitant branch of a common trunk, & the retrograde motion appeared in the vessel itself whether Artery or Vein. Dr Haller has recourse here to some special power not attended to before, he refers it to an attraction of vessels which term is often employed to express what we do not understand, and he accordingly uses the term as a fact without giving any explanation of the thing. — The Phenomenon appears to me to be a necessary consequence of distended Elastic vessels; by supposing a Tension & fullness in these as soon as an aperture

aperture

aperture is made in one in proportion to the flux of that the contiguous vessels are less pressed, & from their Elastic contractility they push the fluids quaquaversum in all directions towards the open orifice; and it is a common maxim in hydraulics, in distended vessels that they run qua data porta. To me it amounts to no more than a proof of the fullness & tension of our sanguiferous system, & by a relaxation made in consequence of depletion it particularly shews not only the fullness of the vessels but also their Elasticity which abates when the stretching powers are removed. The reasonings of Physicians on V.S. have turned on Arteries being rigid invariable canals, and have supposed they can be explained by artificial models; and from the different Mathematical principles they have assumed & from some variety occurring in their Reports they have brought out many conclusions in favour of the doctrines of derivation & revulsion; but their conclusions are useless as proceeding on a wrong supposition. The sole end of their Reports should have turned on determining the degree of contraction in vessels. To know what is the effect in a derivation from distant parts we must enquire into the state of their Contractility before we can make

make any estimate on that footing. We can perceive indeed that while a vessel is opened it may affect the determination of blood, & this more or less in near & distant vessels, & I see how the state of contractility may more or less admit of this, & of this we have the circumstance especially in proof that relaxation in consequence of depletion affects the adjoining vessels most & there at a distance less; this effect takes place while the aperture of the vessel remains; but, as soon as the wound is closed the balance of the system & the proportional distension of fluids will be restored, & hence only the effect of depletion remains. Here therefore I abstract from derivation & revulsion whose effects I imagine are very inconsiderable, & Physicians find little to determine them from whence blood is to be drawn, whether in Pleurisy you operate from the same or the opposite side, & therefore the various disputes of choice of veins, sides &c are trifling & not worth our consideration.

As to the part of the body from whence blood is to be drawn we may presume from Haller's Exper^{ts} that depletion & relaxation must begin & be most considerable in the neighbourhood of the opened vessel. There is a communication

communication of relaxation as well as of stimulus, but this does not extend beyond certain limits & does not take place in the common distribution of the blood vessels; the depletion & relaxation will be always probably greater when the vessel of a part is opened than when general depletion is performed, for a small quantity taken from a part will have more effect than a much greater quantity by a general evacuation. In Ophthalmia I cannot doubt but that a less quantity taken from the part affected will be more beneficial than a vastly larger quantity taken from my arm. If a Rheumatic affection occupys one arm of a patient & I determine to draw blood from the leg there is perhaps a difference in drawing it from the side affected or from the opposite, and this is founded on the communication of the Nervous System; the effects being confined to one side of the body & evacuating in preference from that part affects the principal part of our practice in blood letting & forms the distinction of topical or partial bleeding & general or by a depletion from the whole system. If the affection is entirely topical partial bleeding is indicated, but if this topical affection brings on an affection of the whole system or

or if it happens from a general cause then topical bleeding will have little effect & general bleeding is indicated.

I have thus endeavoured to reduce the effects of bloodletting to depletion producing relaxation in the System, I have endeavoured to refute the notion of the transitory effect of this operation, & have established it as a permanent cause of depletion, but this is not all; we must consider the first act of depletion is more considerable during the flow from the orifice than afterwards when the solids have accommodated themselves to the depletion. A person under violent pain is often relieved by the very opening of the vein, often the relief appears when not more than $\frac{1}{2}$ is drawn off, & ceases before the Arm is tied up; this effect I have observed in a patient under a hysteric fit, & within these six weeks I have had occasion to bleed a person 20 or 30 times, & the good effects appeared by only taking away $\frac{1}{2}$ at a time, & altho' the hysteric fit was very violent, yet the delirium was immediately taken off by that small quantity. To attempt an explanation of this must be attended with difficulty, it perhaps depends on the tension being exquisitely balanced, & that this is a tension not of a simple elastic system but of the nervous system in which alterations of tension will be more quickly

quickly communicated. This is increased by the Nervous System being sensible to relative as well as absolute Sensations.

The following case is very applicable here. A Lady has Dysphagia, the least attempt to swallow throws her into convulsive fits that appear particularly in respiration. It attacks her on any attempt to swallow, relief has been attempted by V.S. which accordingly took off the fit. The necessity of Aliment occasioned repeated recurrences, which were as often taken off by bleeding; the bleeding in this case is observed to have been sufficient if $\frac{3}{4}$ was taken away suddenly, but if it flowed suddenly several ounces were required; as soon as the vein was opened she perceived a shuddering & relief of the fit, & the effect was always in proportion to the suddenness of the evacuation. She has now so long laboured under these fits that habit has rendered them familiar to her & she thinks little of them as bleeding still continues to prove such an immediate remedy. As bleeding then appears to act by taking off Tension it will have more effect as the body is less irritated by the action of Muscles &c; hence it is more important to bleed in a recumbent posture than is commonly supposed.

This

This finishes all I have to say in general of the evacuation of blood, but it is executed in different ways, by veins or arteries. It will be necessary to enquire to which of these we must give the preference. V. S. is attended with this necessary circumstance, the application of a ligature which accumulates the blood between the ligature & the extremity. This circumstance however must give considerable resistance to the flow of blood from the Arteries into the veins. Sometimes the immediate effects of depletion are perceived, but frequently it does not produce a general relaxation in the System from the resistance of the ligature preventing the Arteries from being relaxed & then the effects of depletion do not appear. The evacuation will often bring on a deliquium animi, but this seldom happens if the ligature is kept on, but on the removal of this ensues the deliquium; the reason is, this, that while the blood is accumulated between the ligature & the extremity, the veins between the ligature & the heart are in some measure empty, but when this is taken off the arterial extremities pour their contents suddenly into the veins & a considerable quantity of blood is derived from the vessels of the head which by taking off the excitement of the sensorium produces

*. This is commonly explained by the sudden revulsion from the brain, but I think it more simply accounted for from the relaxation taking place in the subclavian artery which is communicated to the rest of the system.

To shew the sudden effects of relaxation we may mention the following instance.

A person had a bile over the considerably long & inflamed, but otherwise in good health, the surgeon opened the pustule, & the moment a single drop of pus came out a syncope followed which could be only owing to a single relaxation—

produces Syncope & then a relaxation ensues.* Abstract-
ing a quantity of blood in deliquium is found necessary
to produce a relaxation in the System, & this is more ef-
fectually accomplished by the same quantity drawn
from the Venous than from the Arterial System. An
Evacuation from Arteries in time will produce nearly
the same effect, but they sooner accommodate themselves
to the size of the Artery opened, and by their so suddenly
adapting themselves to the size of the vessels to the
diminished quantity of fluids, the effects are not so
soon perceived, & I doubt much if for general depletion
Arteriectomy is so effectual as Phlebotomy; for our Ar-
teries are not to be considered as rigid inflexible tubes
for if this was the case we should find no action
in any diminished quantity of the fluids from hamor-
rhagy &c; the blood would flow thro' without meeting
the least resistance & no distension of the vessels could
take place, but our Arteries are elastic & endued
with a contractile power by which they can diminish
the Areas of their cavities & contract to such a diameter
as may be necessary to procure a proper distension
from the fluids. When our object however is to produce
depletion in Arteries topically near the vessel to be
opened

opened, then Arteriotomy is effectual, and besides the common manner of the Lancet we have two other modes of operating, by cupping or the application of Leeches. By cupping we open the Arteries of a small size & thus produce depletion more slowly, but as its operation is quick this may in some measure compensate for the size of the Artery & perhaps be as effectual as topical Arterial bleeding, it has all the advantages of common Arteriotomy & has likewise these superior advantages that it allows us to approach nearer to the part affected. By Leeches we likewise open Arteries, but with these we have the disadvantage of drawing off blood slowly, and 'tis only by a considerable length of time that we can procure a flux of the blood, & on this account they produce no depletion & its consequent effect relaxation in the system, in general they are only applicable to children, in a few instances however they give us a nearer approach to the part than we can possibly procure by cupping glasses, but this is only in a few instances, & the slowness of the Evacuation is attended with such disadvantages as render it greatly inferior.

We come now to treat of Venous Evacuations & our Indication here is per

Vesicantia

Vesicantia.

The operation of these has been thought various from the matter employed which is generally Cantharides taken into the mass of blood & has been supposed to attenuate it. But the quantity absorbed is too small to have the effect in altering the mixture of the blood, it is generally taken to no greater extent than to produce Strangury & on perceiving this we cannot venture to go farther. This effect will be produced from a grain taken internally, the whole of which is not absorbed in the system. The quantity taken in by the external application of blisters must be less as it does, not always produce Strangury & is therefore less than a grain. The effects then of Blisters must depend on their operation on the skin. Cantharides applied to the skin produces Inflammation & in every species of Inflammation a Stimulus is communicated to the system, & on this circumstance we explain their effects; but in many cases the stimulus communicated to the system in consequence of the application of blisters is so inconsiderable that their power as a Stimulus has been much doubted by Physicians, & indeed it is certain that many systems are so little disposed to propagate Stimuli that a large

large blister may be applied without increasing the pulse; but in the greatest part of men the frequency of the pulse & other sympt^s of fever are induced by Blisters. I admit then their stimulant effects & approve their use in a torpid state of the system in Nervous fevers; but it is doubtful if by this operation they have their principal effects, because we cannot employ analogous stimuli, & inflammatory Stimulants are here generally hurtful, but Cantharides produces a transitory stimulus & the effect of this soon passes off by the ordinary evacuations.

The stimulus is more confined to parts contiguous to its application than to distant portions of the system; it may occasion effusion in parts subjacent to the skin as well as under the cuticle; hence perhaps the use of Blisters in Rheumatism in which we suppose an Inflammⁿ to the ligaments of the joints.

To obtain the stimulus of blisters it was customary about 40 years ago to take off the cuticle in dressing whence expose the naked nerves of the skin to the air; the effects of such maltreatment must be obvious & I think I formerly remember a patient to have been actually killed by it. Another error in practice equally prejudicial with the former was continuing the blister on the part & suffering it to run for a very long time; but if the blister is raised the serum is interposed between

between the Cantharides & the Nerves, if it stimulates it's permanency when suffered to remain long is hurtful. The rubifacientia often relieve rheumatism, by occasioning such an effusion artificially, as we discover in the efforts of Nature spontaneously. Blisters no doubt do the same; their effects, tho' more evidently topical, yet, in some measure, extend generally to the whole system; & there we see the foundation of their greater effects in their partial than in their general application. Physicians indeed in disorders of the head apply blisters to the legs & feet, but here the doctrine of Revulsion will not apply at all; we must refer the whole effect to the relaxation taking off constriction, so universal I suppose in fever.

To the conclusion of this subject I shall only add that tho' the operation of Blisters & their good effects confined to parts only where we can apply them, by the relaxation they produce in the adjoining vessels, yet this effect may be communicated to the whole external surface where they remove the tension of the part, & hence their constant use in fevers in which they have been much more beneficial by their relaxing than their stimulant effects.

I now proceed to speak of the serous discharges by Issues

Issues, Setons &c. These are a less sudden but a longer continued discharge of serum; the evacuation is very inconsiderable & the discharge slow, so that its effect in relaxing the system must be extremely small. But lately we have had reason to believe that the coagulable part of the blood is that matter of which Pus is always formed; & as the discharge of matter necessary to be made into pus is never changed without Inflammation & increased impetus in the vessels of the part, as in Issues, Abscesses &c. where there is more Lymph pushed thro' the vessels than ordinary, and in this view the evacuations from Issues may be more considerable than the quantity would lead us to imagine. We know that there are many effusions in Inflammation & Dropsy readily absorbed without giving pus, tho' stagnation heat & other necessary circumstances occur. We are led then to suppose that it is a remarkably strong Impregnation of serum with Lymph, or this perhaps thrown out only in a diffused state. The discharge of Pus in issues may be considered as a discharge of Lymph which like the red globules comes chiefly from red vessels & in Quesnai's language is a spontaneous of Lymph; hence as the red vessels so influence tension the discharge may have a greater effect than the quantity

quantity would suggest. Large issues may perhaps draw off Lymph faster than is supposed it can be supplied by Aliment, whence this Evacuation may have good effects in relieving various congestions in parts near which they are applied. As Issues cannot remain without Inflammation they hence keep up a considerable Inflammatory state in the part. This together with the abstraction of a quantity of the coagulable lymph may take off the determination to other parts; analogous in this respect to the operation of blisters which by determining to the surface take off the determination from Membranes & Ligaments. In consequence of this Inflammatory determination they obviate a variety of accidents that would otherwise occur & aggravate the disease. If Cold happens & a general Inflammatory state comes on, Abscesses might be formed & other determinations aggravated. Issues perhaps in such a case must have an effect in directing the determination to it; a proof is that a person exposed to such cold as would otherwise give disorder, feels only an unusual Inflammation of his Issues.

I have now given an explanation of the several serous discharges, and I now proceed to consider the
more

more general Evacuations, in which we consider Emetics & Cathartics where fluids of various kinds are evacuated.

Emetics.

This is a copious & intricate subject which I shall endeavour to discuss as simply & clearly as possible; for this purpose I shall first point out the general effects from whence you will easily understand the particular applications.

1.st Then Emetics evacuate the present contents of the Stomach; this is often a necessary indication from Morbid & noxious matter introduced, which do not quickly enough & of themselves excite the Stomach; this is often a necessary indication from Morbid & noxious matter introduced which do not quickly enough & of themselves excite the Stomach, but remain there & are the causes of Sympathic affections in all parts of the system. Many matters too are generated in the Stomach itself, & in many cases they may be corrected but are mostly to be evacuated. The effects of Vomiting have been much mistaken, & a great deal has been imputed to the more evacuation. We often mistake the necessary contents of the Stomach for the purposes of assimilation for noxious matter, there is not one stomach in 50 but what will throw

throw out a considerable quantity of Mucus that is readily thrown out from the follicles. Senac endeavoured to determine by Experiment how much Mucus was contained in these follicles, & by Vomiting you see the quantity is very great. Seldom is our Stomach without Acidity & Mucus in some quantity for necessary purposes in the System, whereas the vulgar think slime or Mucus to be a morbid appearance. If at any time it is noxious it must be owing to a morbid state of the Organ & therefore Evacuation can be of little effect, we must proceed on another indication to alter the state of the Stomach. Vomiting not only evacuates the present contents, but it derives many fluids there not present before. By the Stimulus applied the Muscular fibres are constricted & press upon the Mucous follicles & increase the secretion of the succus gastricus, & by stimulating the intestines the excretories are emulged by inverting the peristaltic motion of the Duodenum, particularly the Biliary & Pancreatic Ducts; hence the so frequent evacuation of bile in vomiting. These considerations lead us to consider Vomiting more as an Evacuation of the whole system than has commonly been supposed, and I have known the water of a considerable Ascites & Anasarca carried off in a few hours by Spontaneous

Spontaneous vomiting, & a Physician of eminence treats dropsies by giving Tartar Emetic with as much success as others do by Hydragogues. Another effect of vomiting is that it not only emulges the excretories of the Stomach but also of the duodenum & brings the excreted fluids into the intestinal cavity, & the whole of the fluids emulged are not perhaps brought into the Stomach, & by bringing bile, pancreatic juice & the peristaltic motion is promoted & a foundation is thereby laid for copious purging. This is explained by the Emetic getting into the intestine, by being washed over the Pylorus, & there acting as a purgative.

We see then how by the exhibition of Vomits an evacuation by Stool may be procured, but where it is carried on by gentler Medicines, such whose Stimulus extend little farther than the Stomach itself, then they operate merely by evacuating the contents of that Organ. Emetics too of this kind, are so far from operating will have a contrary effect, as by their exciting so great a flow from the follicles of the Stomach they diminish the secretion that should pass by the intestines, & from this deficiency of the watery parts the belly becomes bound, hence the good effects of Emetics in removing a Diarrhoea. —

These

These are the effects of Emetics considered as Evacuants, but we must consider that in the act of vomiting there is a constant action of the diaphragm & abdominal muscles, in consequence of this the whole Abdominal viscera must be strongly pressed, and all the blood in these Organs is alternately stopped, the application of weh extends to every Muscular fibre in that cavity. By the interruption this gives to the motion of the blood & the effect on respiration, the blood is variously altered & changed in it's course, besides this vomiting gives a stimulus to other viscera, & hence it's numerous effects are explained. When we consider how much the blood vessels of the liver are out of the ordinary powers of circulation we shall have no difficulty in accounting for the frequent congestions in that viscus, & when Stagnations of this kind take place nothing is more adapted to remove them than ~~other~~ vomiting. When the kidneys are irritated by a Stone vomiting is generally excited in the System. The Stahlians & the Advocates for a natura medicatrix believe that vomiting is excited for the final purpose of promoting the passage of the Stone; it is surely a blind impulse, & we have no security that these effects will be in an exact degree &

It indeed happen when the Stone cannot be removed, it may therefore often be necessary to stop this supposed salutary vomiting. In biliary calculi we excite vomiting with safety notwithstanding the prejudices against it in that disorder. As to the Uterus, ^{the action of} this may be excited by the action of vomiting, & the communication of the Stimulus may likewise take place & vomiting in this view may be an useful Emenagogue; but we give Vomits in uterine hemorrhagys, this seeming difficulty I shall obviate hereafter.

The first motions of vomiting arise from a contraction of the Diaphragm & Abdominal Muscles. The Diaphragm constantly presses the Pylorus & when that is relaxed, the abdominal muscles still continuing to contract shut up the Pylorus & then the contents are thrown up by vomiting. This action is made principally in the time of expiration, & it prevents a full Inspiration which is evident by the frequent & successive draughts of air taken in after vomiting. As it affects respiration so it alternately stops & accelerates the blood & hence must influence the Thoracic Viscera. The Muscular fibres of the Bronchia & the action of the Thorax are constantly associated together, & therefore by exciting the Muscles you will excite too the Muscular fibres of the Bronchia which suffer a simultaneous contraction

Emetics

contraction & relaxation, hence there must be a great pressure on the lungs which must suffer considerable agitations, which emulges the Bronchia & hence may be considered as an useful expectorant.

The effect on the passage of the Blood may occasion considerable regurgitations to the head, hence the suffusion of face &c., these effects are owing to the long suspended Inspirations in vomiting. What are the effects of this as a remedy is uncertain, whether it is prejudicial or not, but its effect is momentary & perhaps produces constriction on the vessels. Practitioners dispute whether it can be employed in the various affections of the head, & have esteemed the administration of it dangerous where congestion was to be actually suspected, but vomiting by the motion it gives the blood may relieve congestion. I own that it is a precarious practice & never ought to be allowed where congestion is any way evident. The various effects of vomiting are easily understood from the compression of the abdominal viscera which urges the blood on to the right ventricle of the heart, & from the rapidity with which it urged thro' the Lungs the left ventricle is excited & the whole circulation increased, & by this general acceleration of the blood copious sweating often comes

comes on. Often from a Momentary vomiting the good effects as the excitement of vessels & the overcoming obstructions will be perceived, this leads into a question whether the operation of Emetic Med^s does not depend on the mere action excited on the extraordinary effort produced, tho' the Evacuation & Nausea may have some effect. The motions of Vomiting are preceded by a state of sickness & are succeeded perhaps by effects as different & important. This subject is involved in great obscurity & depends on the laws of the nervous system in general & on the particular connection of the Stomach with this system. But to us this is incomprehensible both as to its causes & effects, & therefore we cannot enter into it. We can perceive in this Nausea that the action of the heart is weak, the countenance pale, the skin shrunk & contracted, & other marks of want of impetus in the extreme vessels. These are the effects of Emetics & their connection with the system; but from this I must not touch the Explanation of their operations; the like circumstances occur from other causes than the throwing in of Emetics, & various causes of fever & Syncope produce the same state & the same consequences, & therefore the sickness & the sickness & weakness of the heart must excite each other, & hence the sickness induces constriction in the extreme vessels & on this principle its good effects in

in hemorrhages are accounted for which experience confirms, both in this & other increased secretions; but whether they operate in this or any other way is doubtful & we are embarrassed in this respect with considerable difficulties; for, 1. the constriction induced is momentary, & the succeeding action of the vessels increasing the impetus of the blood will do more than compensate for the constriction that before took place & many circumstances shew us that the operation of Emetics determine to the surface, often producing sleep without any sympt^s of vomiting. Emetics joined to an opiate prove the most effectual sudorifics & we have sufficient experience of the powers of Emetics in small doses without producing the action of vomiting, & these commonly contribute to cure of fever, & their effects are explained on this supposition. Emetics then seem to determine to the surface, & at the same time take off constriction, hence the use of Emetics in all kinds of fever in cutaneous diseases which are to be relieved by increasing perspiration. The more this last fact is established the more difficult is their application in hemorrhagy, I wish the fact was more fully ascertained, & that Dr Robinson's cases of vomice being useful in hæmoptoe were thoroughly confirmed. However we account for it, I believe the fact

fact to be true, & so far that I may attempt an explanation of it. — The action of vomiting may greatly increase the impetus of the blood in a particular part; but it does not appear that the reaction does this remarkably but is at least sufficient to remove congestion from any particular part, as the effect of this reaction tho' considerable from extent is not very remarkable in a particular part; for if this was the case vomiting would be pernicious in Inflammations by exciting the blood in a particular part of the system, but any hurtful effects are more than compensated by the great determination to the surface. And if in Hemorrhagy the vessels acquire some increase of impetus yet this may be more than required by the general determination occasioned which takes off particular ones on which hemorrhages & increased secretions often depend; this is certain in diabetes, fluor albus & which subsist often by particular determination. Hemorrhages then in several views may be relieved by Emetics. From what has been said you will see the further application of Emetics & their extensive use in a variety of cases, these will readily occur to you in practice, nor is it necessary for me to condescend more minutely into particulars. I shall therefore proceed to treat of the next class Evacuants.

Purgatives

Purgatives

This has always been considered as one of our most important remedies & of most frequent use, but it is doubtful if the purpose of its application & administration is well understood. I could mention to this, as to the two former titles, a variety of opinions that prevail on this subject. I propose to treat it by pointing out the effects more generally, from whence the particular applications will be understood. By this evacuation the ordinary contents of the intestines are thrown out; these contents are at all times considerable & like the contents of the stomach are often in morbid & noxious states. The evacuation is necessary to the economy as these contents are frequently & regularly thrown out by nature, but if these contents are not thrown out they prove a considerable stimulus to the system, & the evacuation becomes necessary. By the use of purging we not only procure an evacuation of the contents, but by the stimulus applied to the excretories we excite the peristaltic motion & increase the derivation of fluids into the intestinal cavity, & this evacuation is very considerable with respect to the whole system & is much more considerable than Emetics. It may be considered as to the matter evacuated, in 2 ways.

Ist as to Quantity.

If we attend to the length of the intestinal canal & the numerous excretories opening on the surface, stimulated by the peristaltic motion, we shall see that a small increase in each will on the whole give a great Evacuation. It is derived chiefly from the Secretory System, from the Serous vessels, but as it is an abstraction from the blood it may be considered as an Evacuation of the whole Vascular System, & in this view it is so considerable that it may be a question whether Sweat exceeds it.

Purging appears then to occasion great depletion & hence take off Tension. If this can be done without communication of a stimulus it may be good in Inflamm^y cases. The power of purgatives in weakening the System are daily seen, but we cannot suppose them to be proper for Evacuations of blood; they operate slowly with respect to the sanguiferous System & perhaps the cases are few in which we can render it considerable as an evacuation unless there are some Stimulant powers to compensate the effects of relaxation.

IInd Quality.

It has been commonly supposed that the Intestines were the common Cloaca of the System & every species of poisons was expurgated this way, but this opinion is totally groundless.

groundless, for the common vent or outlet of filth are certainly the Urinary passages & Respiration. Practitioners have supposed purgatives were indicated in all impurities in the vicinity of the Intestines. In general Acrimony they are not so effectual as Sudorifics, the passages by the Skin & kidneys being the only proper emissaries of Impurities, & at any rate we cannot suppose a few purgatives will expell a general Acrimony. To answer the purpose continued doses of Purgatives should be indicated & it has been proposed to carry off the superabundance of fluids in this way, by Mercury, first brought into practice by Douglas & Tissot, the good effects of this entirely depend upon the evacuation, as large evacuations will excite proportionable absorptions, & this latter effect will be always as the quantity & suddenness of the evacuation. We can excite absorption probably more copiously by this evacuation than in most others, & hence you will understand its peculiar use in dropsical cases, as any stimulus applied to the alimentary Canal must have great connection with the absorbent system, & this effect is in a ratio of the distances from the stomach, hence more in the intestines than in the stomach, but all stimuli in any part of the canal are useful hence Emetics are
often

often to be used as increasing absorption. By the quantity evacuated & the general depletion directed to a particular part we may allow that considerable revulsion may be made particularly in the system of the venae portarum, & hence its application in disorders of the abdominal viscera in congestions &c. by their continuance of action they stimulate and excite the action of the descending Aorta, & this may be powerful in making a revulsion from the head, hence good in Ophthalmia & other congestions & Inflammatory determinations to the head. Purgatives are considerable internal Stimuli & must make a powerful revulsion from the surface, & take off Inflammatory determination, & often even to a pernicious degree in preventing the eruption or interrupting the progress of Exanthemata. But in cases where the determination to the surface is unusually violent & where the eruption cannot be made equal to the determination then purgatives may divide them & hence their uses in various Exanthemata. The relief they give in Scorbatic eruptions, as they are called, proceeds more from revulsion than from the Evacuation of Impurities. Purgatives we said
by

Purgatives

by affecting the system of the Vena Portarum, and by affecting the Determination of blood from the Aorta descendens may remove congestions in the abdominal viscera; but their stimulus may likewise be communicated along the continuous membranes whence may affect the Ureters & Uterus both by its effects on the Aorta descendens & its stimulus by communication, which may excite a kind of motion in the biliary ducts, their use is accordingly recommended in any affections of these parts, & nothing is more useful than a purge to promote the passage of Calculi along the Ureters.

I will suggest to your enquiry whether the Intestines may not from their connection with the surface operate otherwise than by revulsion & have some reaction on the general system & particularly on the surface, perhaps something analogous to the operation of Emetics in determining to the surface may take place in purgatives, but I cannot so well ascertain the fact in the latter case as in the former. Dr Sydenham's practice seems however to be a confirmation of their efficacy in this way as he often joined opium with a purgative

Purgatives.

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purgative for promoting Diaphoresis, & it is very probable that when we give an Emetic merely to excite Nausea which often acts as a purgative & may by this latter effect occasion a reaction on the surface.

I have now finished the several titles marked out in the Methodus Medendi, & with this, Gentlemen, I conclude this course of Lectures, imperfect as they are; in some parts perhaps arising from the obscurity of the subjects, in others from the inability of the professor. Our limited time however may be some Apology which is totally incompatible with the extensive & comprehensive views that all or most of these subjects require since a period of ten months is hardly sufficient for what must necessarily be done in little more than six. Many think the duty of their Station fulfilled if they deliver doctrines finished in the first & unimproved in any subsequent period of their Professorships, but this superficial discharge of Obligations tho' ^{easily} conciliated to them can never be so to you the Arbiters & impartial spectators of their conduct. For my own part I think the duties of our office can never be under
such

such narrow circumscriptions, on the contrary it is incumbent on a Professor to be as really & extensively useful as possible. On this plan I have always proceeded, I may perhaps have failed in the execution, but my Labours have been directed to the End. I have endeavoured, besides delivering the different Systems of Physicians & pointing out their inaccuracies, to offer doctrines of my own, & suggest hints, the further prosecution of which I leave to your inclination & genius. I shall next year, agreeable to the resolution of the College, deliver a Course of Lectures on the Practice of Physic, in which you will have an opportunity of hearing those principles we have lately offered to your consideration, practically applied; To the perfection of this I shall give up my whole time & attention, hoping by the fruit of these labours to establish some foundation for a future reputation.

May 13.th - 1769.

Finis.





